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VIEWS, NEWS AND INTERVIEWS.

Mr. Frank C. Perkins, of Dunkirk, N. Y., who has spent some months in Europe, returned to New York last week on the "City of Paris." Readers of the ELECTRICAL REVIEW are familiar with Mr. Perkins' interesting correspondence which has appeared at frequent intervals in these columns.

"American electrical specialties are creating a furore at the Crystal Palace Exhibition," said Mr. Perkins. "The Carpenter electrical heating and cooking apparatus, the Ries regulating socket and other devices are exhibited in a department of their own at the Crystal Palace. Interest in these devices is at a high pitch, and sales of apparatus are numerous. The Weston measuring instruments are being introduced in England by Mr. W. J. Hammer, of New York, and have met with sudden and merited popularity. Mr. Hammer is engaged in forming an English company for the manufacture of the Weston instruments."

The number of men working on the Columbian Exposition buildings is now more than 6,000. On some of the buildings work is proceeding day and night.

There is a great demand at the Lynn, Mass., factories of the Thomson-Houston Electric Company for skilled machinists. About 120 new hands of this class were employed last week.

A 180 ton overhead electrical crane is about completed at the Watervliet arsenal.

At the Kansas sorghum experimental station ploughing by electricity was recently given a trial. It was found that the use of the rheostat with the motor is essential to satisfactory results.

The Buffalo *Times* has established a system of branch telephone agencies at leading drug stores throughout the city of Buffalo where advertisements may be left and telephoned to the *Times* office.

The Efficiency of the Lauffen-Frankfort Transmission.

The president of the Frankfort Exhibition, Mr. Sonnemann, has made the following announcement as to the efficiency of transmission of the polyphase system between Frankfort and Lauffen: "Official report of testing committee gives mean efficiency in Frankfort at full load 74 per cent., where loss of energy in dynamo, 8 to 10 per cent., included; from this results for transmission proper to secondary transformer at the exhibition a mean efficiency of from 80 to 82 per cent." It is gratifying to note that the minute investigations of the testing committee bear out the statement of the *Times* correspondent, who, from his personal investigations, gave the efficiency as not less than 75 per cent. "The result obtained in the Lauffen-Frankfort experiment," adds Dr. Maier, "is magnificent. It surpasses even the most sanguine expectations and removes any doubt, if doubt still existed, as to the practical feasibility of electric power transmission over a long distance. It is impossible to foresee the far-reaching consequences of this experiment; it is destined to revolutionize all our industrial methods and to lead to a general utilization of natural forces now running to waste."

Quartz Fibres for Suspension Purposes.

In the electrical laboratory of Queen & Company, Philadelphia, have recently been made a series of careful experiments upon the properties of quartz fibres for use in suspending galvanometer systems and in other physical measurements as compared with fibres of glass, metal and cocoon silk. These tests have shown conclusively that quartz fibres are so greatly superior to all others in every way that the above mentioned firm have decided to prepare them for sale. The following details will be of much interest to our readers:

These fibres are drawn in the oxy-hydrogen flame from pure rock quartz, their diameter being regulated by the speed of drawing. As to size, it is possible to draw them from those too fine to manipulate (less than $\frac{1}{10000}$ inch) up to rods $\frac{1}{10}$ inch in diameter and in lengths (for diameters less than $\frac{1}{10000}$ inch to $\frac{1}{10}$ inch) as desired. Inspection with a microscope shows that they are extremely uniform in diameter and contain no "fishes" or flaws of any kind.

The principal advantages possessed by quartz fibres over all others are: First, Perfect elasticity; they show absolutely no "Nachwirkung" or "set," and when twisted come back to the same position immediately; it is thus possible to reach a much higher degree of sensibility with a galvanometer, using a quartz fibre in place of unspun silk, for, as is well known, a cocoon fibre, to which is attached a system under small controlling force, will not return at once to the zero point within five per cent. of the total deflection. Quartz fibres are also absolutely unaffected by ordinary changes of temperature or atmospheric conditions, whereas silk fibres, absorbing greater or less amounts of moisture at different times, will have correspondingly different zero points.

The tensile strength of quartz fibres is from 50 to 70 tons per square inch, which is nearly as great as the best steel, and many times that of silk. Fibres of extreme fineness may, consequently, be used; as, for example, a quartz suspension $\frac{1}{10000}$ inch in diameter will sustain a weight of one-half gram. They are, however, very easily broken by lateral stress, and it is, therefore, raised or lowered as a whole instead of attempting to bend them around a spindle, although the finer ones can be successfully wound upon spindles of one-half inch or greater diameter.

The uses of quartz fibres are various; they can be employed advantageously for the suspension of all delicate electrometer and galvanometer suspensions. They may also, as suggested by Mr. Boys, be used to suspend very small bodies, the specific gravities of which are required, as there is practically no capillary attraction between the fibre and water. Being unaffected by heat and of very uniform diameter, they are excellent for use as cross hairs in telescopes and microscopes.

For further information regarding quartz fibres see a paper by V. C. Boys, "On the Production, Properties and Some Suggested Uses of the Finest Fibres," Phil. Mag., 1887; also a paper by Prof. Richard Threlfall, on "Elastic Constants of Quartz Threads," Ibid., 1890.

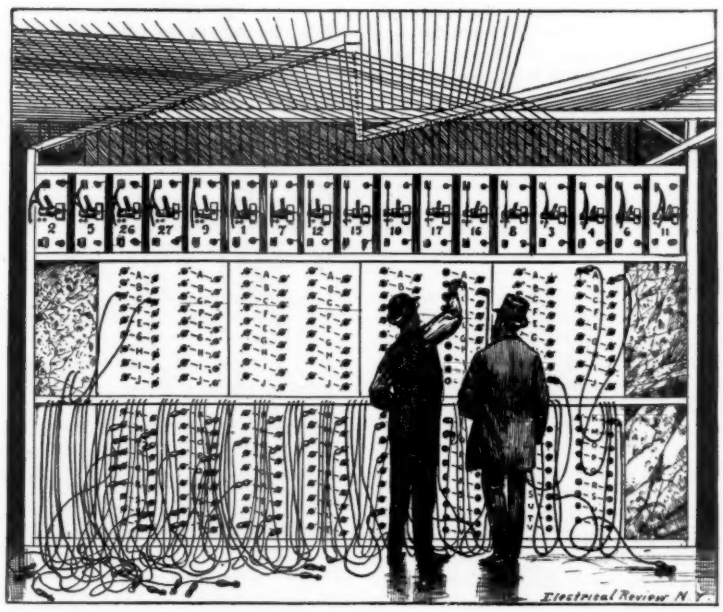


FIG. 1.—NEW SWITCHBOARD AT THE MANHATTAN ELECTRIC LIGHT COMPANY'S STATION, NEW YORK CITY.

OBITUARY.

Mr. Eugene H. Cowles, of Cleveland, O., well known for his work in the electrical extraction of aluminum, died at El Paso, Tex., April 21, of hemorrhage of the lungs.

We regret to learn of the death of Mr. Nikola Tesla's mother. Mr. Tesla's recent visit to Europe was made with the intention of seeing her. Mr. Tesla's return to this country will now be delayed until the middle of May.

The Manhattan Electric Light Company's New Switchboard.

A new switchboard and switches of novel design have been in operation at the station of the Manhattan Electric Light Company, Eightieth street and Avenue B, New York city, for a sufficient length of time to prove their utility and convenience. The accompanying illustrations and description will be of interest, we think, to all central station managers and to others.

The circuit wires from the pole line enter the dynamo room through the upper part of two windows, one being used for the arc wires and the other for the alternating incandescent wires. The latter we will trace.

A wooden framework of 2x3 inch stuff, suspended about one foot from the fire-proof ceiling, carries all the wires in the room, thus facilitating an easy inspection. These incandescent wires run directly over the instrument board, which is shaped in a novel form, 16x9 feet, and has an easy exit on each end to the machines. The instruments are arranged on slate panels, with spaces between, allowing a clear view of the dynamo. The station converters are at the top of these panels; below are placed, in the following order, the pilot lamps, voltmeters and ammeters. Under the panels are slate slabs carrying the rheostats controlling the dynamo exciter, and under these are run the compensators. These are connected in the usual way.

To the converters are attached, besides the usual pilot lamp and voltmeter, a pair of connections, which, with a sliding contact of simple design, connect to one of the two standard Cardew voltmeters and thus reads, by sliding the contact, the voltages of each circuit in succession. These features render it possible for an attendant to properly care for a greater number of circuits than would be the case with the old styles of instrument boards.

From this board the wires run directly to the switchboard and terminate in the circuit interchanging switch at the top of the board. This was designed by the Manhattan Electric Light Company's electrical engineer, Mr. E. E. Stark, in order to obviate the many troubles the company had theretofore experienced with two other switchboards. The first was destroyed by lightning, having been composed largely of wood, occupying 100 feet of one side of the room; and the second nearly destroyed itself by arcing at the time of switching heavily loaded circuits.

Referring to Fig. 2, the circuit wires terminate in the binding posts C+ and C— which are connected to the anchor shaped blades. The lips of the latter fit into two clips, one pair of each on opposite sides of the two inch marbleized slate slab. Therefore, when one pole of a circuit is being broken at, say, the bottom right hand corner of the front side of the slab, the other pole is being broken at the upper left hand corner of the back of the slab, the length of each break of contact being eight inches and having the added advantage of the interposition of the slate slab, thereby effectually preventing an arc or short circuiting from one pole to the other.

To the binding posts of the clips are attached flexible cables, specially insulated; one pair, B1 and B2, terminates in black

handled plugs; the other pair R1 and R2, terminates in red handled plugs. These cables are brought to the front of the board through the middle timber, as illustrated in Fig. 1.

The dynamo wires run directly from the machines to the bus bars at the rear of the board. These bars are supported by boxes made of hard rubber, which act both as insulating supports and receptacles for the plugs. These boxes were designed from suggestions made by Mr. E. A. Leslie, the company's manager. Inside of these boxes are the clips on the bus bar to which the plugs make connection. These latter (the plugs) were designed so that their protecting sleeves extend through holes in the slate board and, when inserted, lock themselves simply by turning the sleeves, which have projecting plugs, in order to prevent their accidentally being pulled out. All permanent joints of bus bars and plugs are soldered.

The sketch of the front of the board (Fig. 1) represents an attendant plugging in one of these plugs into machine "B" bus bar. Each red and black handled plug is stamped with the number of the circuit interchanging switch to which it is attached. The dynamos in the room are lettered A to V. Their terminal bus bar receptacles are lettered on the marbleized face of the board in white to correspond.

Machines A to J belong to one section of shafting; K to Q to another and R to V to another. The circuit interchanging switches are numbered to correspond with the numbers of circuits they contain, and each panel of the instrument board is numbered to correspond.

The method of operation is as follows:

The circuits are running, let us say, on the machines on the lower half of the board, and it is proposed to start, in addition, the machines connected to the upper half of the board. A programme is prepared for the proposed arrangement of the circuits on the different machines.

One pair of the plugs of each switch is always idle; when the front blade is up, the black is idle; when it is down, the red is idle. The idle pair of plugs may be handled as desired, independent of the fact that the circuit is running. Therefore, any or all of the idle pairs of plugs may be plugged onto the bus bars of the machines which are intended to carry the circuits affected by the proposed new arrangement.

After the engine has been started and the machines are at proper voltage, the dynamo engineer, with a stick having a loop of leather on its end, throws the interchanging switch and the operation is then completed. The voltage of the machines onto which the circuits are to be switched is ascertained by means of a special voltmeter plugged into the machine bus bars. The voltage is then regulated to accommodate the circuit to be switched, an allowance being made for the drop of the machine voltage at the time it assumes the load.

The circuit having been arranged for the usual run, the idle plugs are set for an emergency switch-over, *i. e.*, the idle plugs of the more important circuits are set on the bus bars of the spare machines, or on the bus bars of machines carrying less important circuits, so that, in case of trouble to any machine, the interchanging switch can be thrown in an instant without the necessity on the part of the attendant of stopping to think where and how the circuit affected can be put.

This board is built for nineteen 1,000 volt, 60 ampere dynamos and 17 circuits. Its total length is 16 feet. The entire front of the slate is marbleized in imitation of Tennessee marble.

The advantages over all other boards, as claimed by the inventor, Mr. Stark, are:

1. All electrically connected metals are behind the face of the board and are insulated from the slate by hard rubber.
2. It is non-combustible.
3. It is absolutely impossible to get two alternators in parallel through any mistake of the operator.
4. Any circuit can be placed on any machine, thus securing perfect flexibility.
5. The parts of the board are few.
6. It leads to an easy and systematic running of wires.
7. It is a handsome ornament to the dynamo room, rather than a gross disfigurement, as compared with many other types.

Chicago Electric Club.

The question as to whether the trolley system should be used as power for street cars in Chicago was discussed at a largely attended meeting of the Electric Club, held Monday evening, April 11, in their rooms at 103 Adams street. F. W. Parker, who acted as judge in the discussion, presided. Frank L. Perry and Alex. Dow supported the trolley system and its practicability in Chicago. Their position was opposed by St. John V. Day and E. E. Keller.

Mr. Perry, who was the first speaker, said:

"The electric system, as it is to be installed on the South Side, will, as far as

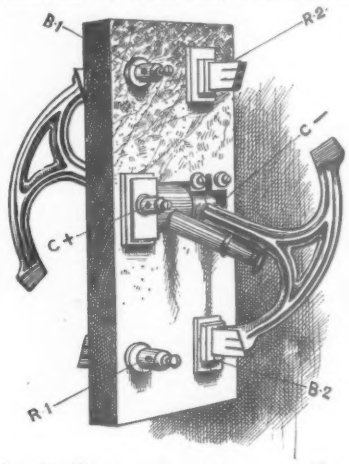


FIG. 2.—VIEW OF SWITCH USED ON MANHATTAN ELECTRIC LIGHT COMPANY'S NEW SWITCHBOARD.

mechanical details are concerned, be far more reliable than the existing cable system. In the cable system we have usually two large engines, either or both of which supply power to the cars through what, for comparison's sake, may be referred to as a single movable power conductor, mounted on movable insulators.

"In the electric feeder system we find an equipment in which the steam plant may be applied in smaller and in a greater number of units than is practicable in a cable system. This flexibility of the driving equipment is a most decided advantage. But the greatest advantage of the electric system lies in the fact that the power reaches the car through immovable conductors mounted on movable insulators. Further than this, in the electric feeder system the cars take current from many immovable conductors and not from a single movable conductor mounted on movable insulators as in the cable system. You will note that I say 'many' immovable conductors. While in the overhead system there may be laid a large number of feed wires, in fact, we may have a veritable network of feeders, there need be only two wires in sight, for the feeders may be buried underground."

Mr. Day said that surface railroads in any form should be dispensed with as far as practicable, if only from a humanitarian standpoint. He outlined what he considered many disadvantages of the trolley overhead wire, including its obstruction to the apparatus of the fire department and its liability to become incapacitated to do the work assigned to it.

E. E. Keller, in his paper sustaining his position, said:

"Electrical conductors suspended in the air would be a hindrance to the movement of the fire department. It would be a poor policy to undo all that has been done in clearing our thoroughfares by erecting a network of trolley wires that would look like a fish net suspended over the intersections of principal streets, such as can be seen in Boston. I do not decry the overhead trolley system in its proper place, but in our business center we should endeavor to carry out the plan of relieving our thoroughfares of every possible obstacle in the way of protecting humanity and our property. If the purchaser is willing to pay the price, underground electrical conduits for street railways can be made an absolute success. The open-slot conduit, designed with proper drainage, and with facilities for reaching the conductors and especially the insulators, can be operated successfully and would not subject the public to such frequent delays as do the cable systems. Little excavation would be necessary to adapt the electric conduit system to most of the tracks already in use. At present an electric railway conduit, with continuous conductors, is being tested on a short line in this city. It appears to the inexperienced as a successful experiment, but I think that this same apparently successful conduit would not operate if extended over a vast network of tracks, unless radical changes were made in its construction and insulation."

Much discussion followed the papers. F. W. Parker, judge of the debate, said that from the arguments offered, the trolley system in outlying districts would be the best, but would not do for crowded thoroughfares.

Electric Lights and Motors in Lima.

The electric light plant in use at Lima, Peru, is the Thomson-Houston system, and is under the control of the Lima Gas Company. The company supplies 135 arc lamps and 2,000 incandescent lamps. It is reported that the city council of Arequipa are now considering the subject of introducing electric lighting there. The city of Lima has over 20 miles of street railways, upon which 30 cars are drawn by horses and mules. The name of the company operating these roads is the Empresa de Tranvias, and it is reported that negotiations are under way for the equipment of these roads with electric motors. It is also reported that other negotiations are being considered for the use of electricity for lighting and other purposes in Callao, Mr. John Harris, of that city, being largely interested therein.

Little Poetry in the Telegraph Operator's Soul.

I was talking to the telegraph operator during a lull in his work, and, with some degree of awe, was dilating upon the mysterious power he controlled with a finger tap.

"It's a wonderful thing, isn't it," I said, "this chaining of the lightning?"

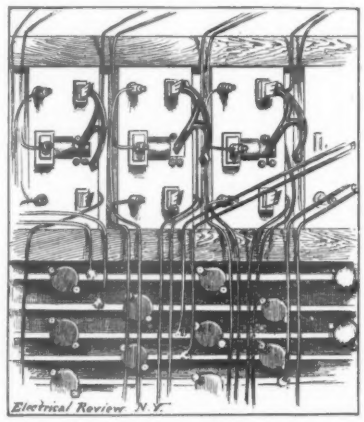


FIG. 3.—BACK VIEW OF MANHATTAN ELECTRIC LIGHT COMPANY'S NEW SWITCHBOARD.

"I've always understood chain lightning was no slouch," he responded, rattling the key of his instrument.

"Your work is most interesting, I should say," I continued, "when the messages go flashing over the wires."

"I never saw one flash, I think. They just go ticketty-tick-tick, mostly, unless a wire's down."

"But in moments of exciting events the wires are kept hot with flying messages, aren't they?"

"I never went outside to feel a wire," he said, slowly, as if he wanted to be sure he was right, "but I don't think the wire ever sets the telegraph poles on fire."

"The lightning-like rapidity with which—" I began, with a sense of something unsatisfactory in the difference of opinion we held, and feeling that the operator had no poetry in his soul, when he made a grab for the key and for the next ten minutes was so busy swearing at something that I became very tired and walked out of the place.—*Detroit Free Press.*

Model Isolated Electric Light Plant.

SHEPARD, NORWELL & COMPANY'S DRY-GOODS HOUSE, BOSTON, MASS.

One of the most compact, yet thoroughly equipped, isolated electric light plants in New England is the one installed recently by the Thomson-Houston isolated electric light department for the above-named business house. The selection and arrangement of the entire equipment of dynamo and engine rooms, as well as boiler plant, was looked after by Mr. J. A. Pierson, electrician and engineer, an employé of Shepard, Norwell & Company.

The dimensions of engine and dynamo room combined are only 50x30 feet, and the equipment comprises the following; One 50 light arc and one 500 light direct incandescent machine; an automatic cut-off engine of 150 horse-power; and two very large "Deane Duplex" steam pumps. The dynamos are from the works of the Thomson-Houston Electric Company, and the engine from C. H. Brown & Company, Fitchburg, Mass.

The engine, by aid of countershafting, distributes power throughout the plant, while the handling of the belts is greatly facilitated by the newly designed loose pulleys furnished by Messrs. H. N. Bates & Company, Boston.

One of the "Deane Duplex" pumps operates the five elevators in the building.

The dynamo and engine room, as well as the boiler room, are kept nicely ventilated by the exhaust fans manufactured by Mr. A. Hunberry, of South Boston.

The devices for controlling or distributing the arc and incandescent systems in use in this plant are the best afforded by the Thomson-Houston factory. The marble switchboard has a variety of switches and a Weston voltmeter for taking care of the incandescent service. By what is termed an "overthrow switch" the entire incandescent service afforded by the plant's machinery may be instantly transferred to the Edison street service and, *vice versa*, back again. The former case would be resorted to only when night lighting of the building was required or accidents happening to the plant's machinery. For outdoor lighting a Thomson-Houston multiple switchboard has been added to the equipment of the plant, thereby connecting it with the street arc lighting service of the Boston Electric Light Company.

The boiler room adjoins the dynamo and engine room and its equipment consists of the following: Two steel tubular boilers of 80 horse-power each, manufactured by the Whittier Machine Company, of Boston; one Jacob's feed water heater, of 200 horse-power; gauges from the American Steam Gauge Company, of Boston; the well-known Spencer damper regulator and various other necessary appurtenances.

The building has been newly wired throughout—with white "Clark" wire—for either two or three-wire system of incandescent lighting. The potential of the plant does not vary over one per cent., from the lights located in dynamo room to those located at far distant points of the building. The wiring and construction labor on this isolated plant shows that care and good judgment have been observed from commencement to finish of the work, and it is a credit to those who did it.

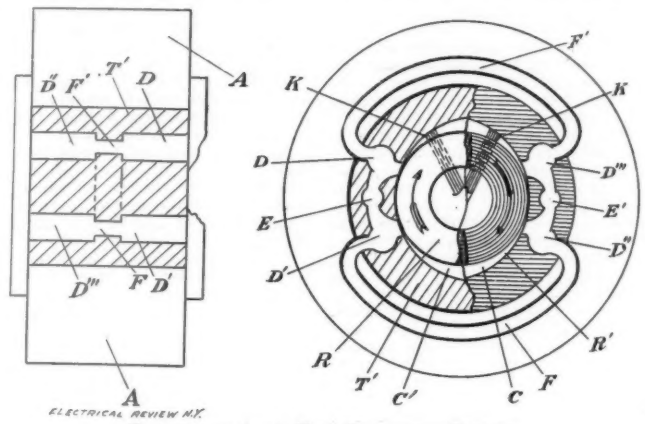
Wants an Assignment Set Aside.

Benjamin Blum, of this city, has brought an action in equity in the United States Court of the State of Maryland, against the Wenstrom Consolidated Dynamo and Motor Company, Edwin L. Tunis (formerly president of the company), John F. Semmes and B. Howard Haman, who were appointed by the Circuit Court of Baltimore the receivers of this company, to set aside certain assignments of patents made by B. Blum. This action is brought against the company for failure to carry out the terms of sale. An application has been made restraining the defendants from making any transfer of patents pending the trial of this action.

A New Hydraulic Clutch.

BY F. M. BARNEY.

The desirability of mounting an electric motor on street cars, elevators, etc., so that a high efficiency will be attained at all speeds, has called forth considerable thought and numerous devices. In my clutch, now made public for the first time, I present a novel method of accomplishing this end. Rapid motion can be accomplished, such as produced by an electric motor, and a variable motion produced, which I may call epicyclic, at a speed within the limits of said motor and in either direction. The device is perfectly applicable to street cars and elevators, and the car can be run in either direction at any speed desired or stopped. At the same time the cumbersome mechanism



FIGS. 3 AND 4.—A NEW HYDRAULIC CLUTCH.

of friction clutches or gear wheels is dispensed with, as well as the noise and wear and tear caused by them. The motors run continuously in one direction, although the car may be started, stopped, or the speed varied, or the direction of motion reversed at will. By my mechanism I obtain a multiplication of power in exact proportion to the difference between the speed of the motor and that of the car, thus obtaining a high efficiency at all times. As the leverage increases with a diminution of speed, it is possible to start a car without using more current than is required to keep up that motion when started. The mechanism is illustrated in the accompanying engravings, in which Fig. 1 is a plan of a rotary pump, the peculiar feature of which is the shape of the chamber C^1, which is placed eccentric to its axial center of rotation. This chamber is formed by a casting T^1, the inside of which is elliptical. In an ellipse of a certain proportion there is a point at right angles to a line drawn from one focus to the other, where all lines drawn through that point from side to side of the ellipse would be of an equal length. This point I make my center of rotation. Connected to the shaft S which enters said chamber is a collar R, which is slotted to receive a solid partition K which is fitted nicely to the top, bottom and sides of the chamber. This collar R fits nicely to the thick side of the elliptical chamber, thus leaving a crescent shaped chamber which is filled with oil. The collar R when revolving carries with it the partition K, which in turn forces the fluid or oil through one of the outlets G G^1 into openings D D^1, and through a by-pass valve E (which can be opened or closed as desired) into the other side. The partition K slides in collar R as it approaches and recedes from the openings. Fig. 2 is a sectional elevation of two such rotary pumps side by side. The outlet of each is connected to the inlet of the other by passages F F^1 (see Fig. 3), the shafts passing to stuffing boxes W W through covers P P^1. The covers with the casting T^1 are bolted firmly together. The rotary pumps are filled with oil through a suitable opening, and the valves E E^1 are closed. The action is as follows: When the shafts are turned in opposite directions at an equal speed, the fluid is forced out of one opening, say, D (Fig. 4), through passage F^1 into passage D^{11}, whence it is carried by sliding partition into D^{111}, through F into D^1, and by sliding partition back to D. As long as this change is uniform the cylinder or containing case A will remain stationary, but should one of the partitions move faster than the other it will tend to compress the fluid in one side of the elliptical chamber, and in order to relieve the strain produced between the partitions K K^1 cylinder A will revolve in the direction of the shaft which moves the faster, and in revolving open the chamber containing the slower shaft, just as it would have been opened if they both revolved at an equal speed. The shafts S S^1 are connected to two motor armatures, the fields of which may be varied to change the speed. On the cylinder A are gears which play into co-operating gears on a wheel of the car axle. If both motors are run at equal speed there will be no reaction and the car will remain stationary. If we wish to move in one direction we increase the speed of the motor moving in that direction, or decrease the speed of the one moving in the opposite direction, and the car will start at first slowly and increase as the difference in speed increases, the load being taken up inversely as the counter electromotive force diminishes. When it is desired to stop the car the motors are brought to an equal speed. There is another plan of causing the epicyclic motion without varying the speed of the motors, thereby doing away with the loss caused by the use of rheostats, etc., and that is by opening or closing either one or the other of the by-pass valves, E E^1. If one of these valves is open while the motor is running at the same speed, it has the same effect as diminishing the speed of the motor connected to that side, by allowing part of the fluid to pass through the valve. This causes a reaction between the pumps and, by simply opening and closing either valve, we can run the car in either direction, or stop it, without interfering with the speed of the motor or its direction of movement. This device is noiseless, simple and durable; it makes a perfect shaft coupling by holding the cylinder A so that it will slip when the load is greater than is safe to carry, and will give a variable speed by controlling the valves as described; it can be applied to any source of power and for any purpose where it is desirable to obtain a variable speed or reverse motion.

More Subways.

The New York Board of Electrical Control met in the Mayor's office last week and resolved to order the building of subways in 50 streets. In the streets that have recently been paved the subways must be constructed under the sidewalks.

The "New Hampshire."

The Providence and Stonington Steamship Company's new steel steamer "New Hampshire" made a record for phenomenal speed on her trial trip at Wilmington, Del., on April 21, 1892. Loaded with 600 tons dead weight, she made the measured mile in two minutes, 59 seconds, an average of over 20 miles per hour. The "New Hampshire" is a sister ship to the "Maine," recently built at Wilmington for the Providence and Stoning Steamship Company, which has also proven a great success, both as a fast sailer and a most comfortable and luxurious boat for passengers.

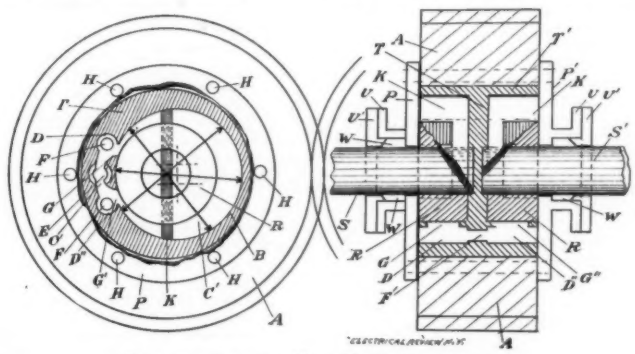
The Heisler Electric Company's Alternating Incandescent Street Lighting System.

Improvements in alternating current apparatus for electric lighting have established its adaptability beyond a doubt for the lighting of streets and outlying districts in towns and cities where arc lights have not been found desirable owing to the existence of shade trees upon both sides of the streets.

The Heisler Electric Company have also recently adapted this type of apparatus for parallel distribution for short distance installations and isolated plants in a manner that might be considered an improvement on the direct current method, being absolutely safe, exceedingly simple and perfectly self-regulating, and owing to the character of the current (alternating) it makes it possible, from a practical standpoint, for the consumer to either burn his light at full brilliancy or reduce it to any point that may be desirable and, if desired, extinguish it altogether. This range of graduation can be accomplished without inserting resistance in series with the lamps, which has heretofore been the method adopted, and which is admitted to be wasteful as well as impractical. Therefore, a system of lighting having the advantage of graduation of the candle-power of the lamp must enlarge its use and make it adapted for use in bedrooms, sick chambers or closets, where it is not desirable to burn the light at full brilliancy. This advantage must enlarge the use for the incandescent lamp and make it perfectly adaptable to all forms of illumination. At the same time, it must result in the saving of the life of the lamps as well as the supply of electric energy.

It is also practicable to operate arc lights from the same circuit and apparatus, which fact greatly increases the flexibility of the system, as it is frequently found desirable to use a few arc lights in large and open areas, such as main halls, rotundas, etc.

The alternation current apparatus, as employed for their long distance series system of distribution, for lighting of streets, stores and suburban districts, requires the minimum of attention, as it is provided with perfect automatic regulation and does not require any special construction or arrangements on the external circuits, or in the station, to provide against the burning out or severe straining of the lights upon the circuit in the event of a lamp in some particular group burning out. Neither are the circuits complicated with transformers in series or other combinations; in fact, nothing further than the automatic regulator and standard ammeter is necessary to maintain the proper balance upon the circuits, making it unnecessary to maintain at the station any complication of devices requiring the constant attention of at least one responsible individual to maintain by hand the proper balance and regulation due to the variation in the number of lights burning. The automatic regulator takes care of these external conditions as closely as would be secured from compound wound apparatus. The advantage claimed in these arrangements is that the buyer is saved the expense of the original purchase of elaborate feeder or switchboards equipped with bank of indicating lights, with the necessary translating devices necessary to maintain the required regulation upon the external circuits. All that is required for the installation of the lamps is the combination automatic cut-out and lamp socket, which is so constructed that the circuit cannot be opened accidentally or intentionally, and in the event of a lamp filament burning out, the circuit is automatically closed.



FIGS. 1 AND 2.—A NEW HYDRAULIC CLUTCH.

The street and indoor fixtures as used for the installation of the lights are constructed to hold any candle-power lamps from 10 to 150 candle-power, and it is possible to use any candle-power lamp at any point upon the circuit, and owing to the type of apparatus and lamps (series), there will be no drop in potential or candle-power, at any point upon the circuit.

Some of the most valuable features that they claim for the system are that it is cheap to install, simple and economical to operate, efficient and reliable, and enables the purchaser to furnish satisfactory service at a minimum of cost to the consumer.

In the manufacture of their long distance apparatus, they base the unit of capacity on the 32 candle-power light, for the reason that they find the 32 candle-power light the most popular size, and by its introduction considerable is saved in cost of installation as compared with the 16 candle-power lamp, which is an unsatisfactory light unless maintained fully up to candle-power, and under these conditions the life of the lamp is comparatively short. It is also a fact that the 32 candle-power lamp is of much higher efficiency, and since we cannot look forward to any great increase in the efficiency of the apparatus, it is desirable that we avail ourselves of the highest efficiency in the lamp, and the Heisler Electric Company are constantly working in the direction of increasing the efficiency of this important part of the system.

The system is now in use in central stations and isolated plants throughout the United States, Mexico and Canada, aggregating a capacity of 200,000 thirty-two candle-power lights.

They also have under construction a very complete transformer system that has been very carefully worked out, in both mechanical and electrical details, in which many of the weak points or defects of the existing types of transformer apparatus have been overcome; and severe tests show beyond a doubt that it must take its place among the transformer systems of the present day.

The Central Building and its Electrical Tenants.

Two things are necessary nowadays to do business successfully; to have something good to sell and a good man to sell it. We know that sort of a man with that sort of a good thing. We refer to the Central Building, New York, Mr. H. W. Douty, general manager. This building has become a landmark and those visiting it have doubtless been unusually impressed. There are a number of concerns in the electrical industry now occupying it and it seems peculiarly adapted to tenants in this line. There is not a better run building in New York, with all the modern improvements, and matters electrical pertaining to the construction of a building have had special attention. A personal acquaintance with Mr. Douty, who is an official of the Central Railroad of New Jersey, induces us to say that a better man to transact business with would be hard to find. If these suggestions are at all pertinent at this time, electrical people desiring nice offices should become intimately acquainted with Mr. Douty and his building.

The First News Message by Telegraph.

BY JOHN W. KIRK, IN "SCRIBNER'S MAGAZINE."

The number of "first" messages by electric telegraph which have been recorded is large enough to have caused discussion, at one time or another, throughout the past 40 years. They range from the first signals given by an electro-magnet in the laboratory of Professor Joseph Henry, at Albany, to the message "What hath God wrought," which marked the formal completion of the line between Washington and Baltimore on May 24, 1844. It is well established that the first message sent over a wire by dot-and-dash signal was "A patient waiter is no loser," which was sent by Alfred Vail in the old factory at Speedwell, N. J., on January 6, 1838, in order to satisfy all doubts of his father, Judge Vail, as to the practicability of this new invention. Another of the earliest messages (sent when the line had been built five miles on the way from Washington to Baltimore) was intended to convince the doubting members of a congressional committee, which I had summoned at Professor Morse's request, that the telegraph could accomplish all that its inventor said that it could. As I was present I can vouch for the authenticity of the incident. The committee were in a little room at the north end of the Capitol, at Washington, where Professor Morse was conducting his experiments. "Now, gentlemen," he said to them, "what shall we send over the wire? Pick out your own message and I will show you how simple this whole thing is, and how it accomplishes everything that I claim." One of the party proposed the message, "Mr. Brown, of Indiana, is here." Professor Morse immediately sent it over the five miles of wire and back by the metallic circuit, the Morse register at his side reproducing exactly the signals which made up the words of the original message. I recall that after leaving the room the congressmen were not convinced by this, because, as those present could not read the indentations on the slip of paper coming from the receiver, we all had to take on faith what Professor Morse told us he had sent and received. One of the congressmen whispered to me, "That's what I call pretty thin." Another remarked, "It won't do. That doesn't prove anything."

I became acquainted with what Professor Morse was doing in those days in a curious way. During the Winter of 1843 and 1844 I had come from Ohio to Washington to look over the bids which my associates and I had sent in for carrying the mails over important stage routes between Wheeling, Cincinnati, St. Louis and other Western towns. This brought me into intimate relations with the post office department, and particularly with the Second Assistant Postmaster-General, the Honorable John A. Bryan, who was a clever Ohio politician, and besides a very cautious man in all his public relations. One day he said to me, "See here! there is an abominable scheme to ruin me," and he proceeded to tell me that his superior officers, in order to implicate him in a foolish transaction, had put into his hands the handling of the appropriation of $30,000 which Congress had voted for the electric experiments of Professor Morse. He believed, as was the almost universal opinion, that the result of Morse's experiments would be to prove that he was impracticable or crazy, and all those associated with the project would be looked upon with suspicion. The Assistant Postmaster-General, therefore, asked me to help him out of the difficulty by undertaking to look after the expenditure of the money as made by Professor Morse. I was to see that if he put up wires and undertook any other actual work, he was to have the money for only what was really accomplished. To that end Mr. Bryan gave me a note to Professor Morse, who seemed pleased at even that much recognition. During the previous Winter I had often seen him about the Capitol waylaying members of Congress and trying to induce them to favor an appropriation for testing his system of telegraphy. I observed much dodging by the members of Congress to avoid him, as he was then considered a crank. Therefore, when Mr. Bryan requested my supervision, I was somewhat prepared for the duty, which under the circumstances I could not well refuse. It was in this capacity that I came to see a great deal of Professor Morse. He had taken possession of a little room in the Capitol, to which I have referred, and day after day, as I watched the careworn, spare and anxious man working in the midst of his curious apparatus, I learned to have sympathy with his sincerity and perseverance. The derision with which the congressional committee had received the preliminary message, to which I have alluded, convinced me of the wisdom of the Postmaster-General in not wishing to be mixed up with what he called "Morse's foolishness"; and, indeed, personally, I was not sure that there was anything in the experiment.

Toward the end of April, the wires being erected for five miles in the direction of Baltimore, I suggested to Professor Morse that now was an opportunity for taking advantage of a great public event, conclusively to prove to everybody that the telegraph was what he claimed it to be. In a few days the Whig National Convention was to meet in Baltimore, and the poles were nearly all set as far as Annapolis Junction—22 miles from Washington, where all the trains stopped. I urged him to push on the stringing of the wire to that point, and have the nomination sent to him in Washington from there as soon as the train arrived from Baltimore bearing the news.

On May 1st, the Whig Convention met in Baltimore, and the eyes of the country were upon it. By that morning Professor Morse had established telegraphic communication between Washington and Annapolis Junction, where was stationed the assistant of Morse, who, I understand, was Alfred Vail. All that afternoon Professor Morse and I were alone together in the little room in the Capitol. A gratifying message had come from Annapolis Junction that everything was ready at that end of the line, and that there could be no doubt of the success of our plan to convince all doubters that the electric telegraph was a wonderful invention, which would revolutionize the transmission of news.

It is almost half a century since that day, and yet I have a vivid recollection of the dramatic incident with which it culminated. The room in which we were was small and dingy, with a window looking out on Pennsylvania Avenue. Across the street was the station of the Baltimore & Ohio Railroad, and all the afternoon we could see the people coming and going, in groups and crowds, eager to learn from passengers on incoming trains the progress of the convention. They were scattered along the track for several hundred feet, as far as the switch where the engine left the train, in order to go back on a Y and push it into the depot. Across the window a shelf had been made of a single board, and on it was the strange-looking machine, with its paper tape and the crank by which the weight was wound up to revolve the rollers through which the tape moved when a message was being received. At the other end of the room was a series of step-like shelves on which were placed the curious pots and jars which made up the primitive battery. Along the floor had been placed narrow strips of scantling, between which were stretched the wires leading from the battery to the telegraphic instruments on the shelf at the window. Over all were a few loose boards on which those walked who entered the room. To this day I can see plainly the narrow disordered room, with its wires and jars and chemicals, and in the midst of it the weird figure of the great inventor who was about to realize his one hope, after so many years of disappointment and delay. He was very quietly dressed, his coat muffled about his throat, and his long hair tumbled about his forehead. He appeared to be nervous and apprehensive. The grave question which was to be settled was whether the electric current would remain on the wires with sufficient strength to work the signals through so long a distance as 44 miles (for in those days a metallic circuit was used). Even those who believed that the instrument had done its work over a short circuit of a few miles doubted its commercial value over long distances.

At this late date the wonder to me is, that so few persons took any interest whatever in the proposed experiment. I was in the room many times preceding this trial, and I recall that there were few visitors and no anxiety whatever to learn how Professor Morse was progressing with his work. A general opinion among those who had heard of the proposed attempt was that it would not succeed. It was too absurd to discuss.

Late in the afternoon, suddenly, the instrument on the table began to click. Eagerly Professor Morse bent forward over the strip of paper that slowly unrolled from the register. The paper halted, moved ahead, stopped, and moved again in an irregular way, till, finally, Morse rose from his close scrutiny of the paper, stood erect, and, looking about him, said, proudly, "Mr. Kirk, the convention has adjourned; the train for Washington from Baltimore has just left Annapolis Junction bearing that information, and my assistant has telegraphed me the ticket nominated." He hesitated, holding in his hand the mysterious message, and then said, "*The ticket is Clay and Frelinghuysen.*"

By a curious coincidence, I am able to describe here, in the exact words of an eyewitness, the scene that was taking place at the other end of the line at this moment. It happened, a few years ago, when I was telling this story in the lobby of a hotel in New York, surrounded by a group of friends, that a stranger who stood near us rose as I finished my story, stretched out his hand, and said, "I hope you will pardon my intrusion, but this story has been a treat to me. They call me Colonel Ralph Plumb in my home in Illinois, where they elect me to Congress. I want to add a word to your story." And then he narrated what he afterward put in writing for me, as follows:

"I was on the way to Washington, on special business, from Ohio, where I then resided, and came to Baltimore on the day that Henry Clay was nominated for president by the Whig National Convention. A train left Baltimore for Washington before the convention had adjourned, but after Mr. Clay had been nominated, and I was a passenger on that train. When we had reached a point near what is now known as Annapolis Junction, the train stopped, and looking for the cause of the halt, I noticed a young man seated on a rudely constructed platform, resting on a square pen made of railway ties, beside a pole which appeared to stand 20 feet high and at its top a cross-piece with two wires, one on either end of the cross-timber. From the car I could see a succession of such poles, cross-pieces, and wires, stretching toward Washington and along the railway track; but I was specially interested in the performance of the young man on the platform above described. He had a small machine before him and was engaged in manipulating it while reading from a manuscript which had been handed him by some one on the train, and on inquiry of him I learned that it was the fact of Mr. Clay's nomination that this young man was sending to Washington. I have since, and very lately, learned that the operator was a Mr. Vail, of New Jersey, and from his son I have a valued photograph of the identical machine I saw his father working with then, and from Mr. Kirk I understand that but two men then living understood how to telegraph messages, one being Mr. S. F. B. Morse and the other Mr. Vail. This message sent, we again started for Washington, arriving an hour later. At the B. & O. depot there was an immense crowd of people awaiting the arrival of the train, for the purpose of getting the news of the result of the Baltimore convention. Nevertheless, the news was there before the train had arrived. It had been received by Professor Morse, written out, printed on slips, and scattered among the waiting crowds; but, it being the first successful attempt ever made to send a telegram for so long a distance, the crowd seemed to have no confidence in what the telegram had told them, until it was verified by passengers on the incoming train."

My recollection of how we announced the news is not vivid. I only recall that when it was proclaimed to the crowd outside they said: "You are quizzing us. It is easy enough for you to guess that Clay is at the head of the ticket; but Frelinghuysen—who the devil is Frelinghuysen?" "I only know," answered Professor Morse, "that it is telegraphed me so from Annapolis Junction, where my operator had the news a few minutes ago from the train that is bringing the delegates."

A search of files of Washington and Baltimore newspapers of that date (May 1, 1844), and days following, shows no reference whatever to this despatch. The *Daily Globe* (which was published in the late evening), on May 1st (with what would now be thought ridiculous ingenuousness), said, in regard to this convention, "The newspapers in Baltimore with which we exchange failed to arrive here to-night, but we have been permitted to look over the Baltimore *Patriot* of this afternoon, which enables us to state from recollection all that is important"—and then follows a brief announcement of the nomination of Clay and Frelinghuysen. This was on the afternoon of the very day when the first news despatch in the history of the world had been sent by telegraph and received in the city where the *Globe* was published. It was not until the line had been completed to Baltimore, on May 24, and the formal message which opened the line, "What hath God wrought," had been sent, that the newspapers began to take any notice of the invention which was to revolutionize the whole business and profession of journalism. In the Baltimore *Patriot* of May 25, 1844 (Saturday afternoon), is what appears to be the first use of the telegraph by a newspaper, which is as follows:

"At half-past 12 o'clock the following was sent to Washington:

"'Ask a reporter to send a despatch to the Baltimore *Patriot* at two o'clock P.M.'

"In about a minute the answer came back:

"'It will be attended to.'

"*Two o'clock*, P. M.—The Despatch has arrived, and is as follows:

"*One o'clock.*—'There has just been made a motion in the House to go into the Committee of the Whole on the Oregon question. Rejected, ayes 79, noes 86.'

"*Half-past one.*—'The House is now engaged on private bills.'

"*Quarter to two.*—'Mr. Atherton is now speaking in the Senate. Mr. S—— will not be in Baltimore to-night.'

"'So that we are thus enabled to give to our readers information from Washington up to two o'clock. This is, indeed, the annihilation of space.'"

In the Washington *Madisonian* of Monday afternoon, May 27, appears for the first time the heading "TELEGRAPHIC NEWS," under which is an account of a Maryland State Convention in Baltimore.

In the Washington *Globe* of the same date is the announcement "that by a telegraph which is in operation between this city and Baltimore we learn that the convention reassembled at four o'clock P M.;" and there is in the same issue a "Postscript from the Telegraph at nine o'clock P. M."

By May 28, the *National Intelligencer* had waked up to the possibilities of the new invention, and had a despatch headed "BY THE MAGNETIC TELEGRAPH," with the explanation that it was "politely furnished by Professor Morse." Editorially it said (seemingly by way of return for this courtesy), "The working of this wonderful result of human ingenuity, acting upon developments in science, excited universal admiration in this city yesterday;" and on the following day, May 29, the newspaper records that the north front of the Capitol was crowded by an anxious multitude to whom the proceedings of the Democratic National Convention in Baltimore were announced.

At last the brave and persevering worker was receiving his reward of popularity, which was expressed in an impromptu organization by the crowd in front of the Capitol on that day, which unanimously voted the following:

"*Resolved*, That the thanks of this meeting be, and they are hereby, tendered to Professor Morse, for the promptitude with which he has reported, *via* his electro-magnetic telegraph, the proceedings of the Baltimore political convention; and that we consider this invention as worthy the countenance and support of the government."

This is the story of the first news message as I recall it. From these few words sent on the afternoon of May 1, 1844, to the present day, the telegraph, as a bearer of news, has grown with astounding rapidity.

The Trolley in Brooklyn.

The Atlantic Avenue Railroad Company, of Brooklyn, is rapidly pushing forward the preliminary work of electrical construction. The power station will be located on the Gowanus Canal, between First and Second streets, and will cover an entire block. There will be a frontage on the canal of 200 feet and 630 feet on a lateral basin. The boiler equipment will consist of three batteries of Babcock & Wilcox boilers, each battery comprising two 250 horse-power boilers. Each boiler will be 23 feet long, the tubes will be one-half inch thick and will rest on extra heavy shelves. Four Corliss tandem compound condensing engines have been ordered; one of 350 horse-power and three of 500 horse-power, which latter will be adopted as the unit for future work; the station having been designed for an ultimate capacity of 5,000 horse-power. The fly-wheel of the largest engines will be 60,000 pounds weight. One condensor and two air pumps have also been ordered, to be run by a smaller engine. Three different kinds of rail are to be laid; that manufactured by the Lewis & Fowler Girder Rail Company, Duplex Street Railway Track Company and the Pennsylvania Steel Company. Samson Bridge joints, made by the Tramway Rail Company, of Pittsburgh, will be used with the last named rail. Ties will be laid 30 inches between centers of 5x9 Florida yellow pine and Connecticut white oak.

The tubular style of poles, with shrunk rings at each joint, will be used, mainly 28 feet long. They will be furnished by Wallace & Company, of New York. Most of the overhead construction will be of span wires, an exception being made as to part of Ninth avenue, where the poles will be placed on one side of the street, with a fifteen foot bracket extending over both tracks. This is practicable at this point as the tracks are not in the center of the street, but more to one side.

An order has been given for 50 cars, to be furnished by the St. Louis Car Company. They will be 27 feet in length, the body being 18 feet six inches. They will be furnished inside with mahogany and three-ply bird's-eye maple, with beveled edge mirrors and bronze trimmings. Peckham's flexible non-oscillating motor trucks, No. 4 B, will be used. It is expected that a portion of the road will be in operation early in July.

THE INCANDESCENT LAMP SUIT.

Hearing of the Appeal of the United States Electric Lighting Company vs. the Edison Company in the United States Circuit Court of Appeals.

THE CONSIDERATIONS PRO AND CON.

In the ELECTRICAL REVIEW of July 25, 1891, was given a complete synopsis of the great suit brought for infringement of the Edison incandescent lamp patent No. 223,898, of January 27, 1880, by the Edison Electric Light Company against the United States Electric Lighting Company, together with the full text of Judge Wallace's decision sustaining the patent. On the settlement of the interlocutory decree, the plaintiff urged that an absolute and peremptory injunction should be awarded, when the defendant urged that under all the equities of the case an injunction should be granted only in the event of its failure to file a bond to indemnify the plaintiff in such amount as might finally be determined by the court a reasonable compensation for use of the invention. The decree, as settled July 23, directed an accounting as to profits and damages and awarded a perpetual injunction, but a stay was granted pending an appeal, allowing the defendant to continue the manufacture of lamps necessary to supply existing or future plants using its dynamos, on condition of filing a bond to meet such damages and profits as might be awarded for such manufacture. The appeal now being heard by the Court of Appeals sitting in Room 122, Post Office building, New York, is based upon the following assignment of errors in the action taken by Judge Wallace:

1. The court should have found that the patent in suit had expired before this suit was brought, because of the expiration of Canadian patent 10,654 of March 17, 1879, for the same invention, and that it, therefore, lacked jurisdiction over the bill.
2. The patent should have been found void *ab initio* for having been issued for a term of 17 years, when it should have been limited on its face to a shorter term so as to expire at the same time with the Canadian patent, or when the patent was "corrected" by the Commissioner of Patents in 1883 upon petition of plaintiff it had imposed a term wholly unknown to law, and was, therefore, void; and the court, therefore, lacked jurisdiction to entertain the bill.
3. Prior to bringing suit, and prior to the infringement complained of, the Edison Electric Light Company had assigned to Thos. A. Edison and others the sole and exclusive right to manufacture and sell the alleged improvements in lamps, and, therefore, the Edison Electric Light Company had not such interest as to enable it to maintain the suit in the manner brought.
4. In not holding that the suit abated on December 31, 1886, by means of the dissolution of "The Edison Electric Light Company," and its merger in the corporation "Edison Electric Light Company," no revivor of the suit having been made.
5. In not holding that if the second claim of the patent is infringed by defendant's lamps, it did not involve the exercise of invention, and was, therefore, not patentable.
6. In interpreting claim 2 of the patent broad enough to include within its scope the lamps made by the defendant.
7. In not finding the broad construction put upon claim 2, anticipated in the prior state of the art.
8. In not finding that the patent did not contain the full, clear and exact description required by the law; and not holding the patent invalid for this reason.
9. In not finding that the specification filed in the Patent Office by Thomas A. Edison in applying for the patent was for the purpose of deceiving the public, made to contain, in some respects, less than the whole truth concerning the alleged invention, or discovery, and in other respects more than was necessary, and that the patent was, therefore, invalid.
10. In not holding that plaintiff's action had been such as to defeat its right to an injunction.

The points raised in this bill of exceptions were more or less involved in the case before the lower tribunal, and a *resumé* of all the arguments was published in the REVIEW above referred to. The great importance of the case and the value of such a discussion as a mode of instruction to those interested in patents would be a sufficient excuse for giving the accompanying synopsis.

On behalf of the United States Electric Lighting Company it is urged that the invention in controversy was patented in Canada November 17, 1879, before the date of the United States patent. The Canadian patent expired March 5, 1883, by reason of the expiration on that date of a corresponding Swedish patent; and accordingly, under the statute which limits a United States patent to expire with the prior foreign patents having the shortest term, the United States patent expired March 5, 1883. If, however, upon the doctrine of the Pohl case, the termination of the Canadian patent before the end of the five years for which it was patented did not immediately terminate the United States patent, then the latter certainly must have expired when the required term (five years) of the Canadian patent ran out. Either date being prior to the filing of the bill in May, 1885, the court had no jurisdiction. In reply to this it is urged by counsel for the Edison Company, first, that the Swedish patent did not *expire* March 5, 1883, but simply *forfeited* on that day, and no forfeiture of any foreign patent could have any effect upon the Canadian patent. But, at any rate, as the Swedish patent did not exist when the Canadian patent was applied for, it was believed, under a true construction of the Canadian law, its expiration or forfeiture could have no effect on the term of the Canadian patent. Moreover, none of these circumstances could have any effect on the United States patent, because the termination of a foreign patent prior to its appointed end by reason of the omission of the patentee to do what some foreign law requires to keep it in force, has no effect upon the duration of a corresponding United States patent. It was believed the Swedish matter was disposed of by the decision of the Supreme Court in the Pohl case, where a German patent was forfeited by reason of failure to work the invention within a specified time; such expiration would not effect a subsequent United States patent, but the latter would last until expiration of the term expressed on the face of the German patent. The testimony of the Canadian lawyers as to the effect of the Swedish patent upon the Canadian patent is not concordant, and the present court will have to follow the rule of the Pohl case announced by our own Supreme Court. The United States patent should run for the full potential term of the Canadian patent; although expressed on its face to be a patent for five years, the Canadian patent act of May 25, 1883, gave it a potential term of 15 years.

In support of the second assignment of error, it is urged that, prior to the issue of the United States patent the invention had been patented in four foreign countries: Canada, November 17, 1879; Belgium, November 29, 1879; Italy, December 6, 1879; and France, January 20, 1880. Notwithstanding these earlier patents, the patent was issued for 17 years. It was subsequently returned to the Commissioner of Patents for correction, including in the petition a list of supposed prior foreign patents, among which was "British patent 4576, dated November 10, 1879," but which in fact had not been issued until after January 27, 1880. The Commissioner of Patents then endorsed on the patent the list of foreign patents, including the British patent, which, having a term of 14 years (the shortest term of all the patents on the list), would cause the United States patent to expire November 17, 1894. Inasmuch as under the correction it would expire November 10, 1893, it was issued for a term one year and seven days shorter than it was entitled to have, and thus had a term unknown to law. In reply to this, it is maintained by Edison's counsel that the Commissioner had no jurisdiction to make any endorsement on the patent. After the issue of a patent, no commissioner has any right to recall or change it, except in the single case of reissue. The question of duration is one fixed by law and outside of the Commissioner's jurisdiction. His endorsement on the patent cannot, therefore, have any effect upon its true status.

As against the right of the Edison Electric Lighting Company to maintain its suit, it was said the corporate existence of this company ceased December 31, 1886, when the company was consolidated with the Edison Company for Isolated Lighting to form a new company known as Edison Electric Light Company. By the act of consolidation the new company became the owner, so far as the State law could effect such a result, of all the rights, properties, franchises and interests of every kind belonging to the several coporations consolidated. But under statue 4,898 the consolidation could not convey the legal title of the patents without a written assignment. Consequently, the new company was not competent to prosecute its suit, nor could the original plaintiff longer ask for an injunction, for its corporate functions expired with the consolidation; it then ceased to manufacture under the patent or to exercise any control over it; it could not longer be injured by infringement. The only way to bring the question before the court was to put the legal title of the patent in the new consolidated company and then by a bill of revivor secure substitution. This not having been done there was no party before the court entitled in any event to an injunction. In reply to this it is said that the plaintiff never by assignment or grant alieniated any portion of its patent, or to any one person or corporation any portion of its exclusive monopoly thereunder. The isolated company has the right concurrently with the plaintiff to manufacture and sell anything relating to electric lights except lamps and other specified articles. It has no rights of any kind in the city of New York. Edison is the exclusive agent to manufacture and sell the lamps, and the 50 light companies owning central station plants and the owners of the 307 isolated plants constitute a body of 365 separate licensees, with the right to use under the plaintiff, the patent in suit. It is not possible to select any one of the various instruments contained in the testimony as alieniating a portion of the plaintiff's right in its patent. The legal and equitable title to the patent within and throughout the city of New York is vested in the plaintiff solely and alone.

The defense maintains (as a fourth point) that if in fact, the plaintiff had ever been the sole owner of the patent in suit, it had ceased to be such and had not such an interest in the same as to enable it to maintain the suit in the manner in which it had been brought. By the contract with Mr. Edison, March 8, 1881, was conveyed the exclusive right to manufacture within the United States, for consumption therein, the incandescent lamp used in the Edison electric lighting system owned by the company. Mr. Edison was to furnish the lamps to various licensees of the Edison company, at a price not exceeding a stated maximum, and was to pay as royalties one-half of the profits upon the manufacture in excess of three cents per lamp. The plaintiff conferred upon the Edison Company for isolated lighting the sole and exclusive right to use, and authorize to use, the whole line of Edison patents relating to electric lighting, in all parts of the United States and Canada, outside of gas limits, and also under certain condition within gas limits. In subsequent contracts with the Edison Company for Isolated Lighting the plaintiff licensed the said company for all territories not transferred to other licensees, to sell and install Edison plants for isolated lighting and for central station lighting, together with all the appurtenances thereto belonging. In view of these various contracts in full force, when the bill was filed, it is urged that the interest which Mr. Edison and the Edison Company for isolated lighting acquired, was such that the plaintiff is not entitled to maintain the suit in its own name. The counsel for the Edison Company maintains that all rights of action on infringements prior to the end of 1886 belonged, at the time of the consolidation, to the Edison Electric Light Company. And those rights of action included all claims for money recovered on account of defendant's infringement prior to end of 1886. Hence it follows that the consolidated Edison Electric Light Company received by the consolidation the rights without any deed or transfer. It descended by operation of law. The effect of the consolidation was not to abate the suit, but the latter may be prosecuted to a final judgment in the same manner as if the corporation had not entered into an agreement of consolidation.

Concerning the question of infringement, the following arguments are submitted by the counsel for the United States Electric Lighting Company:

The claims of the patent in suit must be so interpreted that defendant's lamp cannot be held to infringe.

This construction is necessitated by the following considerations:

An inquiry into the prior state of the art shows that the most of the features of the lamp shown and described in the patent in suit were old and were well understood as factors of an operative incandescent lamp. Among the things thus known were the following: Carbon as the proper material for the burner. High vacuum as a means of preserving the life of the carbon. Globe made entirely of glass as a means of maintaining the high vacuum. Fine platinum wires as leading in conductors. Multiple arc arrangement of the lamps to secure wide subdivision. High total resistance of the burner as a means of securing economy in the size of the main conductors, and as a means of wide distribution. Small cross section of the burner as a means of securing high resistance and small radiating surface. Shaping the burner before carbonization. Lamp-black and tar as materials for the manufacture of burners. In view of such a prior state of the art the patent in suit cannot be sustained if it be so construed as to cover the lamps of the defendant. The patent cannot be construed to cover broadly an incandescent lamp having an exhausted all glass globe, irrespective of the material and construction of the burner.

Nor an incandescent lamp having an exhausted all glass globe and a burner of carbon, irrespective of the shape of the burner and the mode of making it. Nor an incandescent lamp having an exhausted all glass globe and a filamentary burner of carbon, irrespective of the shape of the burner and the mode of making it.

The only things shown and described in the patent in suit which can be regarded as at all patentable in view of the prior state of the art, are:

The masking of a portion of the external surface of the burner, by coiling or some similar arrangement; this being a special mode of securing a high total resistance and at the same time keeping down the active radiating surface within the required small area. The carbonization of the burner by some process that will give it a high specific resistance as compared with the specific resistance of older carbons. The use of a carbonizable cement, in the place of clamps, as a means of securing the ends of the fragile "filament" to the leading-in wires and the use of a burner having a total resistance of not less than 100 ohms hot.

Limiting the patent as thus indicated, none of defendant's lamps infringe. The burners are not spirally coiled, nor otherwise arranged, so as to mask any part of the radiating surface. Nor are the burners made out of a carbon having a high specific resistance. Instead of being made from a "purely structural" carbon (that is, a carbon such as produced by carbonization pure and simple), they are subjected, after carbonization, to a hydrocarbon treatment whereby their pores are filled up with an unstructural or mineral carbon, and their specific resistance is reduced from 50 to 60 per cent., and made substantially equal to that of the old carbons. This unquestionably makes them of low specific resistance. Nor are the burners secured to the leading-in wires by means of a carbonized cement, but by means of clamps—indicated in the patent to be impracticable with carbon "filaments." The burners in two of the three classes of lamps made by the defendant have a working resistance of less than 100 ohms—viz., a resistance, respectively, of 41 and 75 ohms.

The above views as to the necessary limitations of the patented invention will be found to harmonize with limitations imposed by the patent itself.

The third claim requires that the burner be "coiled * * *." The second claim, while not in terms mentioning coiling, is based upon a paragraph in the specification which plainly contemplates that the first claim requires the burner to be "made as described," which should be held to include coiling. The patent again requires that the carbon of the burner shall be of high specific resistance. The patent also requires, in claims 1 and 4, that the union between the carbon burner and the leading-in wires be effected by means of a carbonizable cement carbonized *in situ*. The term "filament," again, when explained in the light of Mr. Edison's many contemporaneous utterances (this new term is not defined in the patent), is found to require that the burner shall have a total resistance hot of not less than 100 ohms.

This interpretation of the patent is supported not only by the prior state of the art, but also by various admissions made by Mr. Edison and by his assignee. The most notable of these are found in the "divisional application of December, 1880," in which the Edison Company sought to obtain a patent with claims tantamount to what they

(*Continued on page* 146.)

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Affairs at the New York Electric Club are looking very bright. The new board of managers assumed office on May 1, and on May 2 the first meeting of the board was held. The gentlemen in command are all workers and good results may be expected.

The "shake-up" caused by the combination of the Thomson-Houston and the Edison Companies is now being felt. The natural policy following a combination is one of condensation. Consequently, quite a number of engineers, salesmen and others must seek new berths. These include numerous high class men, who are forced out by the exigencies of the situation. To those who hold their grip we offer our congratulations, and to those who have joined the cavalcade we extend our best wishes.

Interest during the past week has been centered on the great incandescent lamp case which is now being argued on appeal before the court of last resort. The court room of the United States Circuit Court of Appeals, in the New York post office building, has been the Mecca toward which those electrical pilgrims who could afford the time have turned their footsteps. The attorneys engaged in the case have been followed by a large and attentive audience during every session of the court. The effects of the final decision in this case, which is one of the most important in the history of the electrical industry, will be far-reaching and of vital importance. The opinion of the court is what we are all waiting for. We present in this issue a comprehensive *resumé* of the arguments now being delivered before the court.

The application of electric power to the propelling of boats is receiving considerable attention. A fleet of these boats is expected to be in commission at the World's Fair. In this matter English electricians seem to be in advance of their American cousins. Electric launches are in daily use on the Thames, and we note that the specially built electric launch constructed by Messrs. Woodhouse & Rawson, United Limited, at their Chiswick Works, to the order of the Southport Corporation, for use on their artificial lake, was running during the Easter holidays with remarkable success. We are informed that this boat, "The Bonnie Southport," will seat 49 persons, is 38 feet five inches long, has seven feet six inches beam, and draws about two feet three inches of water. She is carvel built of bright mahogany, with a large counter, and is propelled by a five horse-power "W. & R." motor.

Notwithstanding the croakers, the trolley seems to be arriving at its destination with great rapidity.

A number of changes in address and locations made by our friends May 1 are noted in a column headed "Removals" on page 150 of this issue.

Judge McPherson has recently rendered a decision which exempts the Westinghouse Electric and Manufacturing Company from taxation because it is organized exclusively for manufacturing purposes. Such a decision is broad and encouraging. The court also declares that the State has no right to tax patent rights, this exemption extending, however, only to the intangible right existing in the patent, not to the tangible articles manufactured under patent rights.

Professor S. P. Langley in discussing "Mechanical Flight," in a recent issue of the *Cosmopolitan*, makes the following apt remarks:

"It has been said that those who ask attention to a new truth (and a new truth is always looked on with suspicion) find that its public reception passes through three stages. In the first, its advocate is told that his so-called truth is opposed to all that is known, and absurd; in the second, that if proved true it would be useless; in the third (which is the stage where its ultimate success appears probable), that it has always been known and that no one needs to be told of it."

Governor Flower's remarks accompanying his approval of the recent bill incorporating the General Electric Company are valuable as a precedent and show great foresight on the part of the governor. "The measure is approved," says the governor, "because it is claimed that its effect will be to keep within the State a corporation which professes to be ready to invest a large amount of capital, and which, without the concessions allowed by its proposed charter, would be incorporated under the laws of New Jersey."

Referring to these remarks, the New York *Sun* says, editorially:

Here we have a clear and luminous statement of a principle which ought never to be left out of sight. One of the first duties of the legislative power is to do whatever is practicable to bring within the limits of the State every productive enterprise, every branch of manufacturing industry and every useful corporation which can be induced to establish itself here, adding to the number of profitable employments for labor and solid investments for capital.

No idea and no provision should be incorporated in the laws respecting taxation which will drive industry and enterprise away from the State; and everything should be attempted which will bring them within our borders.

Governor Flower has enunciated a rule which cannot be too deeply studied or regarded by all who are concerned in the administration of the State government.

THE INCANDESCENT LAMP SUIT.

(*Continued from page 145.*)

now assert to be the correct meaning of the claims of the patent in suit. Thus, one of the claims of the "divisional application" was:

"An electric lamp giving light by incandescence, consisting of a hermetically sealed glass enclosing chamber and an incandescing conductor enclosed by the same, composed of a flexible carbon filament, substantially as set forth."

When referred by the Patent Office to the existing patent as ground for rejecting the new application, the Edison Company, using the name of Mr. Edison, declared that the claims of the patent were for "specific means," and did not cover, and were not designed to cover, the invention which it was then sought to patent; and they especially pointed out and emphasized the fact that the lamp of the patent was characterized by "the disadvantage of being provided with a closely-coiled filament, parts of which do not radiate available light."

This view of the patent is the only tenable explanation of plaintiff's long delay to sue the defendant. Neither Mr. Edison nor the plaintiff then deemed the patent broad enough to include defendant's lamps. It was only after they had been thwarted in their attempt to secure another patent, the claims of which should be broad enough to meet the case, that they concluded to put the existing patent in suit, and assert for its claims an interpretation which they had repeatedly disavowed in the proceedings in the Patent Office.

The suit was a mere experiment. The Edison Company had failed to get the broad patent they had long fought for; there was nothing left for them to do but to acquiesce indefinitely in the alleged infringement (as they had been doing for five full years) or else bring suit under the narrow patent they already had. They had nothing to lose by the suit save only the costs, but everything to gain. It was pure gambling on the chances.

Judge Bradley's decision in the McKeesport suit, made a part of the record by the plaintiff, really supports defendant's present contention. Judge Bradley says, indeed, that "the great discovery in the art" was "that of adopting high resistance in the conductor with a small illuminating surface," but he does not decide that even this was an original invention with Mr. Edison. He does, however, distinctly set forth that Mr. Edison is not entitled to claim any credit for it by reason of the patent in suit, for he finds that this invention was "well indicated and shown" in Edison's earlier application for his platinum lamp, filed in April, 1879. Judge Bradley strongly supports the position that there was no invention in 1879 merely in sealing up a carbon burner in an exhausted all-glass globe, but that the field for invention lay in the mode of making a suitable burner to be thus sealed up in a lamp.

The plaintiff appeals to the decisions made in England and in Germany, in suits under the corresponding patents granted in those countries. The net result of the various foreign decisions is in defendant's favor. The latest decision abroad is that rendered by the Appellate Court in Germany. The decision was made after full consideration of all the litigation that had been had in Great Britain, and takes substantially the same view of the Edison invention that the defendant contends for here. It holds that the Swan lamp, which has a burner made of a carbonized thread that is uncoiled, does not embody the Edison invention.

There is no warrant for the proposition that the patented invention "created a new art." In fact, the invention did not produce any appreciable effect upon an existing art.

During the two years succeeding this patent, the Edison Company appear to have sold only about 34,000 lamps. There is no reason to suppose that even the slow progress that was made, during the few years succeeding the issue of the patent in suit, was in any measure due to this patent. Mr. Edison had taken out a large number of other patents. The labels affixed by the Edison Lamp Company to their lamps show the said company to have been licensed under one hundred and twenty-one patents owned by the plaintiff. The Edison Company have always represented some of these other patents to be "fundamental" patents, and Dr. Chandler, testifying for said company, singles out one of them especially (the "feeder and main" patent) and says that it was the invention to which that patent relates that solved the problem of incandescent lighting. There is no evidence that a single lamp made in conformity with the description of the patent, and without the use of other inventions not known to the art at the date of the patent, ever went into practical use.

In fact, the lamp of the patent is of the most inferior character. Mr. Batchelor says that the "tar-putty" lamps "were not sufficiently practical to put out as a commercial lamp." So, also, as to the lamps with "thread" burners, Batchelor says: "They were not considered by us as commercial

lamps in any sense;" and Upton says that the thread "presented the objection of being fragile, uneven in texture and unmanageable." As to burners made from "wood splints," Mr. Batchelor testifies "we have never succeeded in making an incandescent lamp having an exogenous wood as the arc or the burner, which could, by any stretch of language, be called a commercial lamp." Finally, as to burners made from paper, Mr. Edison himself, in the McKeesport suit, dilates upon the many difficulties connected with the use of paper, which caused him "to discontinue its use for commercial purposes." Mr. Batchelor says that they followed up the use of paper, "and proved it of no commercial value." Nor can it be urged that the patent made a valuable contribution to the art. All of merit in this regard had already been contributed to the world's fund of knowledge at earlier dates. These ideas (not to go further back) had been more elaborately developed by Lane-Fox in his British patents, and also by Mr. Edison himself in his earlier patent relating to the platinum lamps.

The decision of Judge Wallace contains a finding of facts as to the prior state of the art, which seems to defendant to require logically that the patent be construed narrowly.

The contrary conclusion reached by the court seems to be the result measurably of certain misapprehensions of fact on the part of the court. Thus, in dealing with the question of "coiling" the court appears to have assumed, but erroneously, that the coiled form of burner and the uncoiled form are alternatives or equivalents. The fact is not as thus assumed by the court. The burner of an incandescent lamp of a given length and cross-section will not do its work just as well uncoiled as coiled. It is absolutely impossible that a burner whose cross-section and whose length remains unchanged shall give out at normal incandescence the same volume of light when drawn out straight or bent into the hairpin form as when coiled into a close spiral. So, again, in considering the question whether, in view of the prior state of the art, the patent can be so interpreted as to cover broadly a lamp composed of a carbon filament enclosed in an exhausted all-glass globe (the only construction of the second claim under which defendant's lamps can be held), the court seems to have overlooked the important fact that some of the carbons of the prior art (for instance, some of the Sawyer-Man carbons and some of the Adams carbons) were smaller in cross-section, and so more filamentary, than some of the filamentary burners of the modern commercial lamps.

The Circuit Court, therefore, should have found that it did not involve invention to substitute a carbon filament for a platinum filament in the older platinum burner lamps of Lane-Fox and Edison.

Aside from any question as to the scope of its claims, the patent in suit is fatally defective by reason of its ambiguity and its failure to present that full, clear and exact description of the invention which the law makes imperative.

The Supreme Court in Germany pronounced the German patent to be "extraordinarily obscure." Justice Kay, commenting upon the British patent, speaks of the "crude manner and imperfection of description in every part." Lord Fry, in the English Court of Appeal, said that the court at one time doubted whether the British patent "was not studiously and willfully obscure." Judge Wallace says that "the specification is a perplexing one; also: "I think the cloud that hung over this patent was in the claims—in the language of the patent itself. That is the greatest cloud that hung over it."

One of the chief sources of ambiguity in the patent is that it does not define what is meant by the term "carbonization." As the term was generally understood at the date of the patent it would be wholly inadequate to produce practical burners. Moreover, the testimony shows that Mr. Edison did not, in fact, practice that method of carbonization, but had a method of his own, to wit, by the combined use of the electric current and the air pump—a method not at that time known to the art. If we regard this electrical mode of carbonization as a thing known to the art (in fact it was known only to Mr. Edison and his confidential associates, and by them kept secret), the patent is fatally ambiguous. If, on the other hand, this mode of carbonization be not regarded as belonging to the art at that date, his neglect to include a description of it in his patent was a non-compliance with the law that is equally fatal to the validity of his patent.

The description contained in the patent is not sufficient to enable a person skilled in the art to construct a practical lamp without resort to inventions not at that date known to the public.

The patent, again, is fatally defective in that contains no definition of the pivotal term "filament." This term was new in the art, and is used to characterize that thing which constitutes the important element in each of the claims.

Not only does the patent fail to explain this new term in the art, but plaintiff's experts, though repeatedly challenged to define it, have been unable to do so. There is one point as to which they are agreed and positive, viz., that length is not an element in the thing called "filament," but that smallness of cross section is essential to it. How small in cross-section the burner must be to constitute it a "filament," plaintiff's experts are unable to determine.

The result (upon the plaintiff's theory) is a patent whose virtue depends upon a device to which an unexplained name is given, and which differs from things older in the art (if it differs from them at all) merely in the matter of degree or size. But the public is not advised by the patent, nor can it otherwise determine, what the size must be, and thus what the limits are that distinguish the patented device from the devices that the public has a right to make. In other words, the patent is lacking in the very data which the public has a right to know, and which the law makes imperative.

The evidence also shows that Mr. Edison, when applying for his patent, must have believed paper to be the best material out of which to make burners for his lamps. It also shows that he knew it to be essential to the carbonization of paper that it be treated while under strain and pressure; and he had devised and was using various modes of practically applying this strain and pressure.

As to all these matters, again, the patent is profoundly silent.

Plaintiff's laches have been such that it has forfeited any right to an injunction which it may have had originally.

In the present case the infringement complained of was carried on openly, in the most public manner, in all parts of the country, for a period of fully five years before the suit was brought.

Defendant has erected over a thousand electric lighting plants, with an aggregate lamp capacity of 350,000 lamps and involving an estimated capital of $5,000,000. The lamps used in these plants constitute but a small percentage, about two and one-half per cent., of the total cost of the plants; but the lamps have short life and have to be continually renewed. If not renewed the whole plant becomes inoperative. The plaintiff is shown not to be in position to supply these plants with lamps in case the defendant should be enjoined from further manufacture. Moreover, the Edison lamp, as made by the licensees of the plaintiff, is shown to be practically unsuited for use with a large portion of the apparatus of defendant's manufacture now in use by the plants that defendant has erected.

It does not appear that the plaintiff, who is not a manufacturer of lamps, will suffer other than a merely nominal injury from the refusal of the injunction; while the granting of the injunction would be destructive of millions of capital—not only the capital invested by the defendant in its manufacturing operations, but the capital of local lighting companies in all parts of the country.

For all these reasons no injunction should have been awarded against the defendant in connection with the interlocutory decree. Sound practice in equity would have dictated that the question of an injunction be reserved until the coming in of the master's report and the settlement of the final decree.

Either, therefore, the decree below should be reversed absolutely as to the injunction clause, or such clause should be modified as above suggested—this being the most to which under any conditions the plaintiff is entitled.

In favor of the patent it is urged by the counsel for the Edison Company:

The essential features of this invention as covered by the second claim are: 1. The carbon filament. 2. A receiver made entirely of glass. 3. A high vacuum in the receiver. 4. Conductors passing through the glass.

That the first element of the combination covered by the second claim of the patent was individually new with Edison is manifest, for the exhaustive researches of the appellant have not disclosed the prior existence anywhere in the world, for any purpose whatever, of a carbon structure having the definitely small diameter which is an essential characteristic of the carbon filament of that claim. Nor do such researches disclose that the aim and object which led Edison to seek, discover and adopt a filamentary form in carbon burners was ever within the contemplation of any other experimenter except Lane-Fox, who was not only later than Edison in the possession of the intellectual conception, but who never embodied that conception in any operative device.

Thus analyzed, it is apparent that the progress made by Edison in contriving the combination of the second claim of the patent, consisted in conceiving and creating a carbon filament, and also consisted in putting that new thing in the inside of an old receiver made entirely of glass and exhausted of air, and in electrically uniting the ends of that new carbon filament with the ends of the old conductors passing through the old glass receiver.

That which characterizes the carbon filament of the patent from the carbon rods of the prior lamps is the greater tenuity of the former, and the consequent high resistance and small radiating surface, or high ratio of resistance to radiating surface, of the former compared with the latter. In other words, it is high resistance produced on the *principle of reducing the diameter* of the burner rather than on the principle *of increasing its length*. The latter principle of obtaining high resistance is ineffective, because the increase of resistance is accompanied by a corresponding *increase* of the extent of radiating surface, and no increase in the ratio of resistance to surface is produced. The former principle gives an increase of resistance accompanied by a *decrease* of radiating surface, and, consequently, produces a *multiplied effect* upon the ratio of resistance to surface. For illustration, the resistance of a burner can be increased four-fold by *increasing its length* four-fold; its surface will also be increased four-fold, and the ratio of resistance to surface will be unchanged. But by *reducing the diameter* of a burner by one-half, its resistance will be likewise increased four-fold, while its surface is reduced two-fold, thus increasing the ratio of resistance to surface eight-fold. Mr. Edison's carbon filament, therefore, is a structure made tenuous on a definite principle, for a definite purpose (peculiar to and essential in incandescent lamps, though not so in any other electric translating device), whereby the same natural laws which obstructed the advance of prior experimenters are made the very elements of its success.

Making now the comparison between the millimeter carbon rod $\frac{1}{25}$ or .040 of an inch in diameter and the filament $\frac{1}{100}$ or .005 of an inch in diameter, we have results due to a reduction in diameter of eight times. The filament under consideration having one eighth the diameter of the rod with which it is compared, will, for the same length, have one eighth the surface and 64 times the resistance. To give the two burners the same surface the length of the filament must be increased eight times, which will correspondingly increase its resistance, making it now 512 times the resistance of the rod.

We now have two burners each of the same surface, and one 512 times the resistance of the other. They will each give the same amount of light when raised to the same temperature, and will require the same expenditure of energy, but the filament will take that energy in the form of minimum current and maximum electromotive force, while the rod will require a maximum current and minimum electromotive force, thus making a difference in the size of the conductors required to supply the two with current, which difference in size, applying the exact methods furnished by Joule's law, will be 512 times; the filamentary lamp being operated with a conductor 512 times less in cross section than that required to operate the rod lamp, at the same percentage of loss of energy in the circuit, or in other words, 512 of the filamentary lamps under consideration, can be operated in multiple arc with the same size conductor which will be required to operate one of the rod lamps.

It is notable that neither Lane-Fox, Farmer, Sawyer-Man, nor those great *expert*—experts, and latter day inventors of things already invented, Morton and Cross—found the carbon filament obvious in Edison's French platinum patent until after he had pointed it out and built it.

The state of the art is thoroughly discussed in the briefs of both sides. As the several alleged anticipating devices were described and illustrated in the issue of the REVIEW above referred to, reference may be had thereto by those wishing to make further examination of this phase of the controversy. It is found to the satisfaction of one side that the invention is fully anticipated by the efforts of Starr or King, Roberts, de Changy, Lodyguine, Konn, Bouliguine, Fontaine, Sawyer-Man, Swan, Adams, Farmer, Lane-Fox, but it is shown by the other side that none of these efforts resulted in a successful lamp. In regard to the claim of the defendant that *coiling* is an essential characteristic of the filament claimed, it is urged—that an examination of the patent shows that coiling was to *prevent the flickering of the light*. At the date of Mr. Edison's invention steam engines did not run with sufficient steadiness to prevent fluctuation, hence, it is not at all surprising that he should provide a means for preventing flickering. This he proposed to do by coiling so as to increase the mass relative to radiating surface without relinquishing the advantage of high resistance gained by its tenuous form. He contemplated that with a properly constructed engine coiling would be unnecessary. Indeed, his commercial form of lamps in December, 1879, before filing the application of the patent in suit, and before any infringer had entered the field, had plain loop filaments not coiled. The conclusion reached by Judge Wallace, that the coil form of filament is only an alternative feature, and not a constituent of the second claim, is inevitable. In regard to the attempted limitation to the high specific resistance of the carbon, this is a carefully omitted qualification from the second claim, and although the first claim is limited to a lamp having such a filament, it is clear that the second claim was intended to cover a combination having a carbon filament of proper resistance, whether attained by high or low specific resistance. Although 100 ohms was the lowest resistance mentioned in the patent, it is not said or implied that a lower resistance would not be compatible with the invention. All that the patent calls for is a great resistance as compared with former resistances of from one to four ohms. Lamps made by Edison, contemporaneously with his application, had a resistance as low as 70 ohms hot, and the model filed with the application has a carbon burner of a total resistance of 43 ohms hot. The contention that the second claim should be limited to conductors electrically united to the carbon filament in the particular way described in the patent is answered by the statement in the patent that the particular filaments therein described cannot be clamped with sufficient force to insure a good contact. It was held by Judge Wallace that the first claim calls for a filament secured by the method described, because that claim includes the clause "secured to metallic wires as set forth," which imported that particular process into the claim. He held that such limitations being absent from the second claim the latter was not limited to any particular form of union. The charge that Mr. Edison, in making the fifth claim of his application filed December 15, 1880, which was a divisional application of the patent in suit, proves that he did not intend to make the second claim of the patent have the construction put upon it by Judge Wallace, is vigorously assailed. The fifth claim referred to is not identical with the second claim of the patent, as it is limited to a *flexible* carbon filament having *high resistance*, both of which limitations are absent from the second claim of the patent, and besides this the doctrine of estoppel could not be invoked because said fifth claim was not made for more than 13 months after the filing of the parent case. Whatever conclusions Mr. Edison or his attorneys arrived at at that time could not change the status of the previously filed case. In reply to the charge of ambiguity in the patent, it is said that a filament carbonized wholly in a closed chamber under a method well known at the date of Edison's application will, in combination with the other parts of the second claim of the patent, constitute a useful incandescent lamp. The fact that it would not be as durable or burn so brightly as a filament carbonized partly by external heat and partly by means of an electric current does not affect the validity of the claim, as the Supreme Court has decided that a description is not defective in the eye of the law on account of mere omission to mention something of value to the invention. This same rule of law covers also the alleged deficiency of the patent in failing to state that, in forming the vacuum, it is not alone necessary to exhaust the air from the globe, but is also necessary to expel from the filament gases occluded therein by passing a current of electricity through it during the pumping operation. The small amount of occluded gases is diffused throughout the globe and only operates to somewhat shorten the life of the lamp. The failure to recite these refinements in a basic patent is no impeachment of its validity. The alleged deficiency based on a theoretical opinion of Elihu Thomson that it is not practicable to make a serviceable filament from lamp-black and tar according to the directions of the patent without the aid of inventions not known when it was applied for, is unimportant because this is only one of the forms of filament described in the patent; besides no patent has ever been held void for insufficiency upon uncorroborated theoretical testimony. The omission to show by a crucial practical test that the patent was insufficient in this particular is a practical admission of want of confidence in this charge. On the other hand practical tests authorized by the plaintiff show that the processes criticised will produce practical lamps.

It was not necessary to the distinctness of the claim that the word filament should be defined. The philological difficulty which these lawyers labor under is only one of definition. They seem to insist that Mr. Edison after making and exhibiting a lamp, naming their parts and uses, should enlarge lexicographical facilities by defining the geometrical size of a filament. Its meaning is sufficiently clear, being derived from the latin *filum*, a thread, and meaning *thread-like*. And the patent distinguishes it from rods of carbon. In the meaning of the second claim every carbon conductor which by reason of its small cross-section attains the results sought by the filament of the patent is within the terms of the claim. It is a carbon structure having such tenuity as to be thread-like. The illustrations of the patent are the tar putty thread having a diameter before carbonization of .007 inch and after carbonization .004 to .005 inch in diameter, and the model of the patent which has a diameter of .015 inch. The defendant's lamps fall within these limits; whereas the Sawyer-Man burner and the Adams and Konn burners had a diameter of 1-32 of an inch, which are not classifiable as filaments, because they are much larger than the ordinary cotton threads of commerce. In regard to the omission to mention electric heating on the pumps and the claim set up that such omission was coupled with intention to deceive the public, no evidence is furnished to sustain such a charge. Edison could not have intended to keep it secret for he had already published it in his French patent of March 28, 1879. But whether he had disclosed it elsewhere, or not, there was no legal necessity for describing it in the patent in suit, because it is no part of any invention claimed in that patent. He was obliged only to explain one method of making the lamp, and a carbon filament good enough for the purposes of the patent could be made as therein described. The strain and pressure omission is unimportant, because filaments made of lamp black and tar have no tendency to curl and require no pressure, and bamboo splints have very little. The fact that Edison explains in his testimony that something is laid on top of the paper during carbonization is, therefore, no evidence of intent to deceive. With regard to plaintiff's laches in bringing the suit, in all the cases in which the Supreme Court has applied the doctrine of laches, the delay was much longer than in the case at bar. It has been held in various cases that eight years, seven years, 7½ years, were not enough to amount to laches. Moreover, plaintiff's delay in bringing suit was excusable. In 1882, the defendant was warned against infringement of its rights. This suit was commenced in May, 1885; meantime the patent in suit had been taken out in France and England, and a suit commenced against the Maxim lamp in France and the Swan lamp in England. Both by direct notice and through the public prints the defendant was advised as early as 1882 of the claims of the plaintiff to an exclusive right to make and sell the lamps of the patent in suit. The defendant repudiated and defied the claims on the ground that the fundamental principles has been demonstrated before Edison. There was no acquiescence in the infringement, and the length of time was not enough to render the claim stale. In view of the uncertainty of the term of the United States patent by reason of the short term of the prior Canadian patent which uncertainty was not definitely settled until 1889, when the Supreme Court in Bate *vs.* Hammond established the right of the plaintiff to maintain a suit in equity notwithstanding the Canadian patent, this suit was really premature when it was brought in 1885. Numerous authorities establish the principle that laches may be explained and when explained cannot be relied upon as a defense, and that such defense can affect the past only and not the future; that notice of infringement debars the defense, and that laches, even if proved, will not stay an injunction for the future.

THE ATTORNEYS.

The Edison Electric Light Company is represented by Eaton & Lewis, Clarence A. Seward, Grosvenor P. Lowrey, Albert H. Walker and Richard N. Dyer, and the United States Electric Lighting Company by S. A. Duncan, L. E. Curtis, E. Wetmore and F. A. Betts.

IT WILL BE FINAL.

The testimony involved in the case is very voluminous. As one of the attorneys remarked, the case has grown (in pages) to a size which has few parallels and involves in argument a latitude and ingenuity which may serve as a monument of professional skill.

The argument will close on Wednesday night or Thursday morning, 4th or 5th inst., but a decision will not be expected for a week or more later. The case is heard before Judges E. H. Lacomb and Nathaniel Shipman.

Both sides seem confident of success. The fact that the decision rendered by the court will be final raises the interest of all to fever heat.

Mr. E. D. Carter, vice-president of the Ball Engine Company, Erie, Pa., was a recent sojourner in New York city, and enjoyed a visit with a number of electrical gentlemen at the Electric Club.

The people of California, who are just now enjoying a series of earthquakes, should send for Dr. Otto A. Moses, of New York, and his seismometer.

Telephonic News

*** It is proposed to construct a telephone line between Christiania and Bergen, in Norway, a distance of about 315 miles.

*** The Salem, Mass., board of aldermen has granted permission to the New England Telephone Company to place its wires underground in that city.

*** The New England Telephone Company has begun the construction of a metallic circuit long distance telephone line between Bellows Falls, Vt., and Keene, N. H.

*** Tucson, Ariz. T., is soon to open a telephone exchange. Service will be rendered to private houses as well as to business concerns, and the people are subscribing rapidly.

*** Macon, Ga., will be in close connection with Atlanta by telephone. The Southern Bell Telephone Company has finished the line along the country road to Griffin and will soon build on to Macon.

Submarine Cables.

LAYING A BIG TELEPHONE CABLE IN THE NORTH RIVER—AN 18-CONDUCTOR KERITE.

The very difficult and important work of putting down submarine cables has been reduced to a science. Years of experience and improved appliances have caused this interesting work to become one of certainty and rapidity, and accidents are now never dreamed of, although formerly quite numerous.

The illustrations on this page and the following page present excellent views of the laying of an immense cable across the Hudson River from the foot of Vesey street, New York city, to the foot of Morgan street, Jersey City, N. J. In the first view is shown the immense Kerite cable coiled on the front of the boat "Western Union," built exclusively for this purpose. The cable was made for the Metropolitan Telephone and Telegraph Company, is an 18-conductor submarine armored, and was built by the Kerite Company, one of the most successful cable manufacturers in the country. This special cable is 5,300 feet in length, and was laid on Saturday, April 16. After the work of making fast in the cable house at the foot of Vesey street, New York, had been accomplished, it required about eight minutes from the time the boat started until the cable had been paid out on the bottom of the river and the boat had arrived at the pier on the Jersey City side.

The method of unreeling the cable is easily seen from Fig. 2, which is made from a photograph taken just before the boat had finished its trip. A cut of a 20-conductor cable is shown in Fig. 4, and a picture of A. G. Day, the inventor, in Fig. 3. The boat "Western Union," which is the property of the Western Union Telegraph Company, is in command of Capt. George T. Olmstead, and Mr. A. Kline has charge of the work of laying. Mr. Kline has, probably, had more experience in the work of putting down submarine cables than any man in this country, and his work on this occasion was witnessed by Mr. W. R. Brixey, the general manager of the Day's Kerite Company, Col. W. H. Eckert, a representative of the REVIEW and a number of other gentlemen.

When it is considered that through these cables conversation is to be carried on between New York city, Washington, Pittsburgh, Philadelphia, Buffalo and, no doubt, in time, Chicago, our readers can readily realize the importance of careful work in the construction of such cables. The Kerite Company, one of the oldest and most widely known companies in the world, possesses an enviable reputation in the manufacture of all kinds of insulated wires and cables, and has been particularly successful in satisfying the severe tests and specifications demanded by the thoroughly wideawake and experienced experts of the telephone companies. As an evidence of the great business built up by the Kerite Company and which is just now most actively and ably managed by Mr. Brixey, the works at Seymour, Conn., are run until 10 o'clock at night and sometimes longer to enable the factory to turn out the work fast enough.

An important consideration in the maintenance of these cables is the risk the companies owning them have to run in the likelihood of large ships breaking them. There is no legal redress for such damages, and the Western Union Telegraph Company and the Metropolitan Telephone Company have both suffered heavy loss, from time to time, in this respect. Then, to make matters worse, these powerful cables generally break the propellors, often tearing off a blade or two, and this damage the cable owners have to pay, besides suffering their own loss. This does not seem altogether fair, and an act of Congress has been suggested, which would more equitably provide for this case. The difficulty apparently consists in knowing just who should bear the brunt of the blame.

In a recent article in the New York *Sun*, the following incident of cable destroying is related:

"An ocean going steamship, in leaving her dock at Jersey City, plowed up the soft bottom with her powerful propellor and secured a costly and valuable catch in the shape of about a dozen submarine cables,

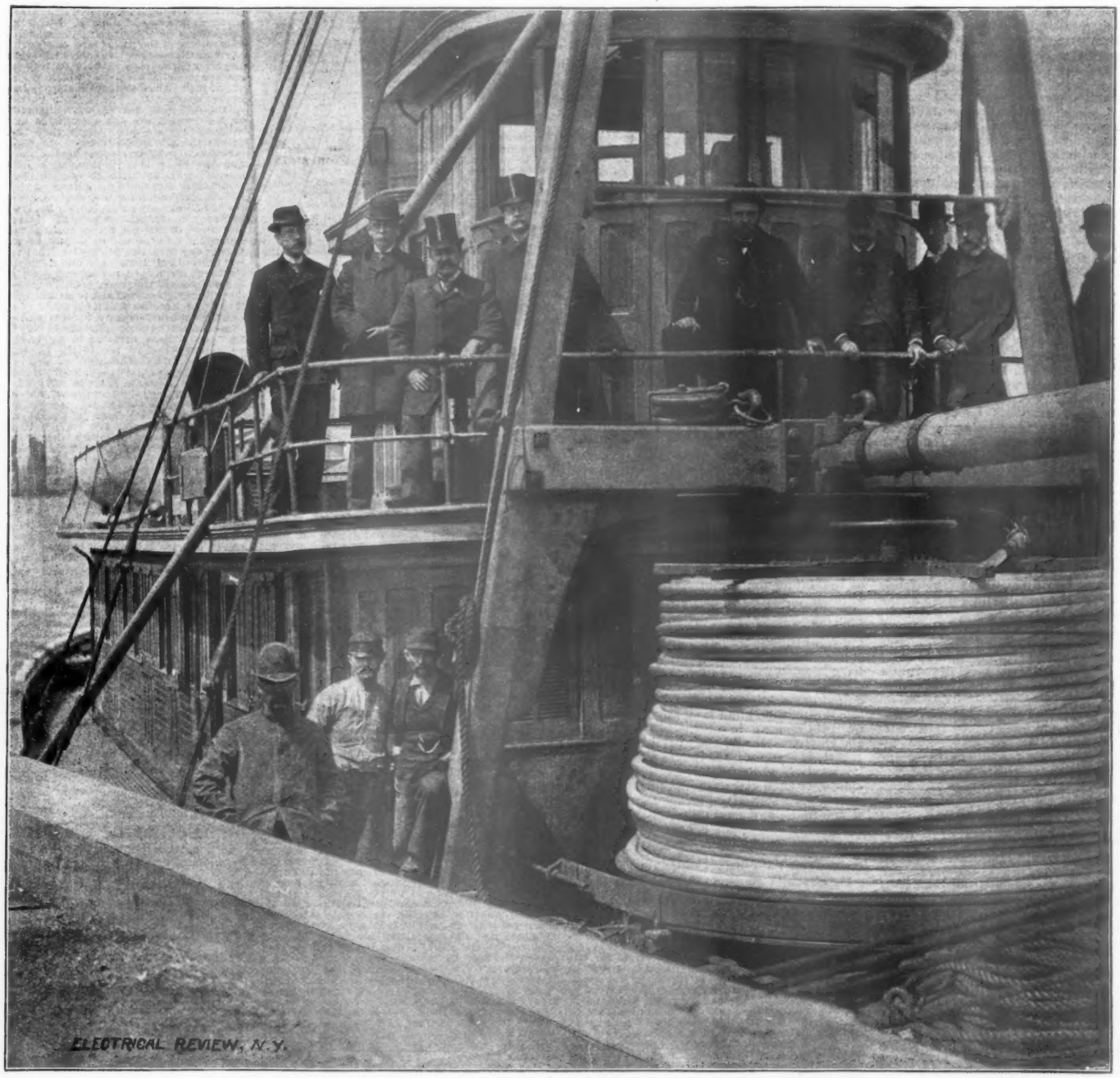


FIG. 1.—SUBMARINE CABLES.—"KERITE" CABLE ON THE CABLE LAYING TUG "WESTERN UNION."

which enmeshed themselves in the blades of the propellor so effectively that all the cables were torn asunder, and the ship had to go into dry dock to clear her screw of the garlands of iron, hemp and Kerite with which it had become embellished—not to say embarrassed. The cable is the property of the American Telephone and Telegraph Company, and serves to connect the pole line across Staten Island with that running through New Jersey, the cable crossing the Kills between Linoleumville and Carteret. Few would believe that a cable could resist long enough to be twisted up into such

FIG. 3.—MR. A. G. DAY, INVENTOR OF "KERITE."

hideous shapes instead of breaking almost at once. The cable, which is a seven conductor, Kerite make, has been down for about five years, and was found to be in perfect condition when repairs were made. Indeed, the snarl testifies to that."

The Telautograph in New York.

The Gray National Telautographic Company, of which Prof. Elisha Gray, of Chicago, is the inventor, has opened an office in this city at 80 Broadway. Col. W. H. Eckert, the widely known telephone man and recently New York agent for the Kerite Company, will have charge of the New York office from May 1.

The telautograph, as most of our readers are aware, is a device for sending autograph messages by telegraph and promises to be a very successful invention, and one that will come into large use, particularly, between main telegraph offices and business houses that have a great deal of telegraphing to do. The company has an extensive factory near Highland Park, Chicago, and is now ready to push its business in all directions.

Moonlight Schedule for May.

The following schedule was calculated on the basis of light one-half hour after sunset and one hour before moonset. Extinguish one hour after moonrise and one hour before sunrise. The schedule obtains for the whole of the United States.

MAY, 1892.

Day of Month.	Light.	Day of Month.	Extinguish.	No. of Hrs.
	H. M.		H. M.	H. M.
1	P. M. 11.40			4.20
2		2	A. M. 4.00	
3	A. M. 12.30	3	" 4.00	3.40
4	" 1.00	4	" 3.50	2.50
5	" 1.30	5	" 3.50	2.20
6	" 1.50	6	" 3.50	2.00
7	" 2.10	7	" 3.50	1.40
8	" 2.30	8	" 3.50	1.20
9	No light.	9	No light.	0.00
10	No light.	10	No light.	0.00
11	No light.	11	No light.	0.00
12	P. M. 7.40	12	P. M. 9.00	1.20
13	" 7.40	13	" 10.10	2.30
14	" 7.40	14	" 11.10	3.30
15	" 7.40	15	" 12.00	4.20
16	" 7.40	17	A. M. 12.50	5.10
17	" 7.40	18	" 1.30	5.50
18	" 7.40	19	" 2.10	6.30
19	" 7.40	20	" 2.40	7.00
20	" 7.40	21	" 3.00	7.20
21	" 7.40	22	" 3.30	7.50
22	" 7.50	23	" 3.40	7.50
23	" 7.50	24	" 3.30	7.40
24	" 7.50	25	" 3.30	7.40
25	" 7.50	26	" 3.30	7.40
26	" 7.50	27	" 3.30	7.40
27	" 7.50	28	" 3.30	7.40
28	" 9.20	29	" 3.30	6.10
29	" 10.10	30	" 3.30	5.20
30	" 11.00	31	" 3.30	4.30
31	" 11.30	June 1	" 3.30	4.00
			Total,	135.40

LITERARY.

We have received "Reports From the Consuls of the United States," for March, 1892.

"On the Track of Columbus," a valuable and interesting paper by Horatio J. Perry, is one of the features of the May *New England Magazine*.

About none of the magazines of this month seems there to be such a freshness of Spring time as the May *Ladies' Home Journal* which goes out to its hundreds of thousands of readers laden with song.

We have received the annual register of the School of Mines of Columbia College, New York, for 1892–3. The course in electrical engineering occupies two years and is well and practically arranged.

"Journal of the (British) Institution of Electrical Engineers," for April, 1892, contains Nikola Tesla's recent address on "Experiments With Alternate Currents of High Potential and High Frequency," delivered before that body.

Scribner's Magazine for May opens with the second article in the series on "The Poor in Great Cities," in which Jacob A. Riis, the author of "How the Other Half Lives," repeats his first success which has gained him such wide recognition.

The May issue of the *Cosmopolitan*, under the joint editorship of William Dean Howells and John Brisben Walker, is an example of the highest excellence in magazine literature. The list of authors in this issue embrace some of the most prominent in current

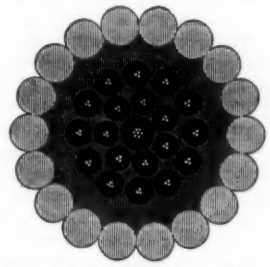


FIG. 4.—A 20-CONDUCTOR "KERITE" CABLE.

literary labor. The pictures are by acknowledged masters in the art of illustration, and in both subject and rendition are of value.

"Proceedings of the United States Naval Institute," volume xviii, No. 1, has come to hand. This journal, under the able editorship of Ensign H. G. Dresel, the secretary and treasurer of the Institute, becomes of more value and interest with each succeeding issue.

Writing of the poor children of New York, in the May *Scribner's*, Jacob A. Riis remarks that we have to take into account that "half the poverty, the ignorance and the helplessness of the cities of the Old World is dumped at our door by immigration," while the procession of the strong and the able move on to the West

The *North American Review*, in its May number, furnishes, as usual, its rich contribution to the discussion of the leading topics of the day. The rounded and ample manner in which important matters are analyzed by men of distinction, whose opinions are authoritative and to whom the public eagerly listen, give peculiar weight to this influential publication. In the first article, "The Man or the Party?" significant, entertaining, and instructive expressions of opinion are to be found from Senators Quay and Vest, and from Representatives Boutelle, Burrows, Wilson and Kilgore.

TELEGRAPHIC

.... A local telephone exchange is being installed in the Edison building, 44 Broad street, New York. The switchboard will have 88 drops.

.... It is reported that the Japanese government has promised a subsidy towards the construction of a proposed new submarine cable between British Columbia and Japan.

.... The Western Union is now running four additional large copper wires between New York and Chicago, which will cost in the aggregate about $180,000. The company has now in all 21,000 offices and about 28,000 employés.

.... T. J. Thorn, Western Union manager at Aspen, Colo., has been arrested in a criminal action on 12 separate complaints filed by the Western Union superintendent, charging him with divulging the contents of telegraph messages.

.... The Postal Telegraph Company has leased the site upon which 251, 252 and 253 Broadway, New York, stand from the Trinity Church Corporation at a rental of $53,500 a year, and will erect thereon a big 13 story structure like the Potter building. The lease is to run for 23 years, with the option of renewals. The company will have to pay taxes and assessments, as well as the big rental and other expenses incidental to such a lease.

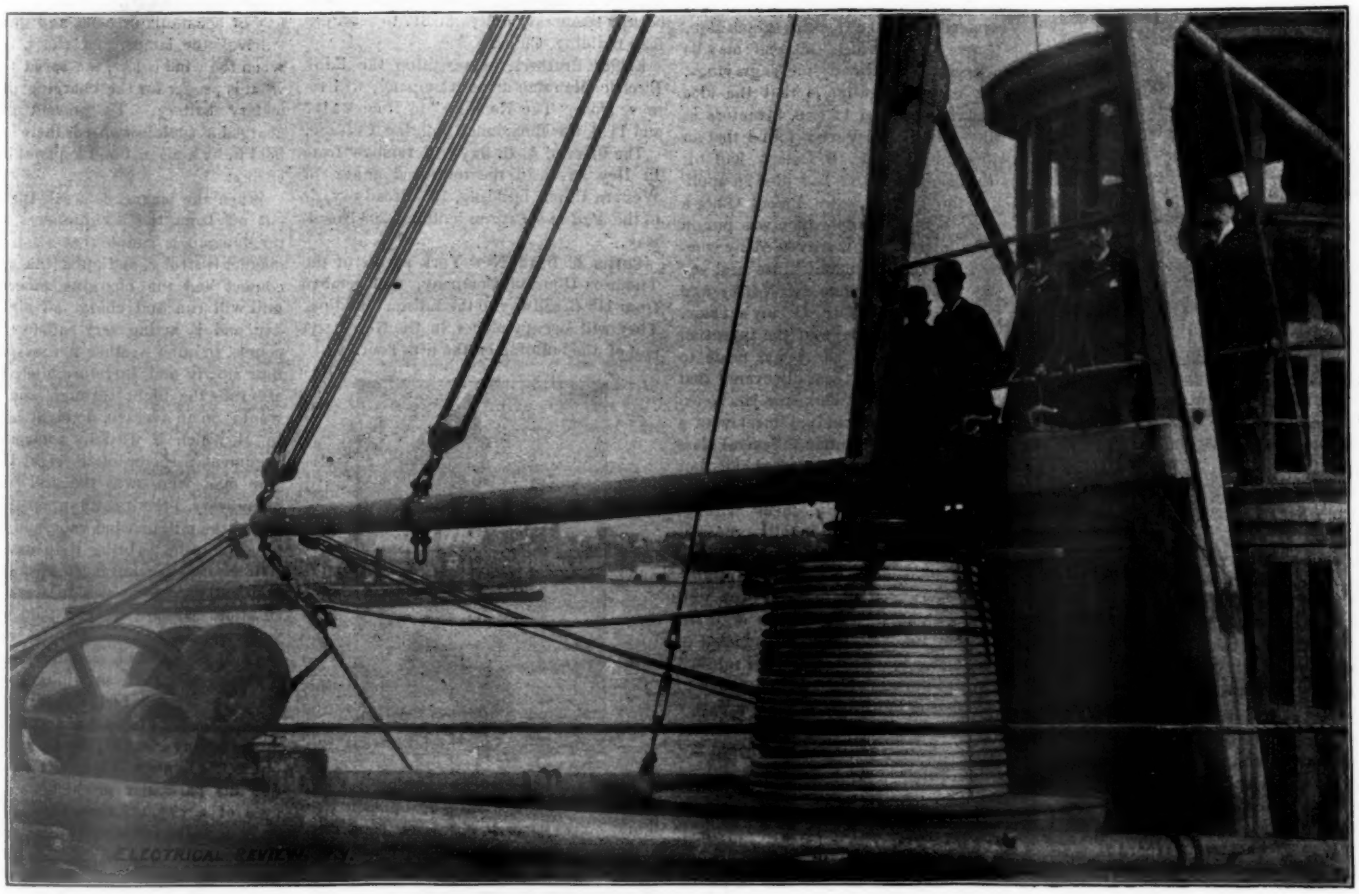
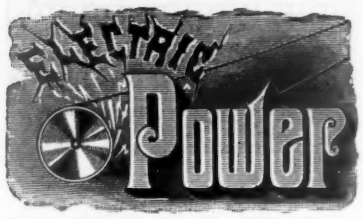


FIG. 2.—SUBMARINE CABLES.—SHOWING METHOD USED IN UNREELING "KERITE" CABLE LAID IN THE HUDSON RIVER

Telephone Output.

The output of the American Bell Telephone Company for the month ending April 20 was as follows:

	1892.	1891.	Inc.
Gross output	8,590	6,413	2,177
Returned	4,598	3,278	1,320
Net	3,992	3,135	857
From Dec. 20, 1891, to April 20, 1892:			
Gross	30,488	22,367	8,121
Returned	17,604	12,839	4,765
Net	12,884	9,528	3,356



* * Camden, Me., has voted to grant the use of the streets to the Rockland & Camden Electric Railroad.

* * The water power of the San Gabriel and Tejungas canons will be utilized to furnish electricity for Los Angeles, Cal.

* * The Short Electric Railway Company has secured the order for 32 car equipments complete from the Fort Wayne, Ind., Electric Railroad Company.

* * Judgments aggregating $40,000 have been entered against Allen & Swiney, proprietors of the electric railway of Dubuque, Ia. The judgments are in favor of Eastern creditors.

* * The electric railway between East Liverpool and Wellsville, Ohio, has doubled its equipment in five months. The apparatus of the Short Electric Railway Company, of Cleveland, is used.

* * The case of the trustee of the Key City Motor Company was decided by Judge Linehan at Dubuque, Ia., in favor of plaintiff. This was an action to foreclose a first mortgage for $50,000, with interest.

* * About one-third of the 42 miles of track which the Interstate Electric Railway purposes constructing between North Attleboro and Bullocks Point, R. I., has been completed, and the work will now proceed with alacrity, certain financial deficiencies having been overcome. The American Electrical Works, of Providence, have an order for 60 miles of heavy feeder wire (250,000 pounds) and 42 miles of trolley wire (75,000 pounds) to be delivered not later than this week. Negotiations are in progress for the purchase of the old Richmond Paper Mill, on the Seakonk, as a power plant. If this cannot be acquired, the Interstate will utilize the braid mill at Attleboro Falls. President Dagget declares that the road will be all ready for traffic to Bullocks Point before the middle of August.

GENERAL NOTES.

The annual report of the Commercial Cable Company was filed in New York last week. The report shows that the company has issued $7,716,000 of its authorized capital of $10,000,000. The debts of the company are placed at $2,000,000 and its assets at $10,000,000.

Bell telephone stock boomed on the Boston exchange, April 21. The stock got quite a boost on the strength of the announcement that three very valuable patents on the carbon contact will be issued May 3 to Edison, who has assigned them to the Western Union Telegraph Company, which in turn has sold them to the Bell Company. The stock opened at 204, up ¾, and advanced rapidly to 209, from which it reacted, closing at 207½, up 3¾. The rights closed at 16½, up 1.

The executive committee of the Erie Telegraph and Telephone Company have recommended to the directors that a quarterly dividend of one per cent. be declared payable May 16 to stockholders of record May 7. The Cleveland Telephone Company, the Northwestern Telephone Exchange Company and the Southwestern Telegraph and Telephone Company, report for the three months ending March 31, 1892, a gross income of $221,693.66; gross expenses, including dividends paid, $218,148.45; surplus, $3,545.21; proportion of dividends received by the Erie Telegraph and Telephone Company, $55,035; dividend No. 34, $48,000; surplus, $7,035; total surplus for the three months, $10,580.21; number of subscribers connected December 31, 1891, 14,011; added during the quarter, 235; total number connected March 31, 1892, 14,246.

The Varley Battery Jar.

It is sometimes said that the day of small inventions is past and the numerous ingenious notions which, in clever Yankee hands, have resulted in an abundance of simple contrivances in daily use, have been exhausted. It would hardly be expected that the gravity battery, one of the oldest pieces of electrical apparatus, would be susceptible of marked improvement. Mr. Richard Varley, Jr., electrician of the International Okonite Company, has agreeably disappointed such an expectation. We illustrate herewith a change in a battery jar, due to his perseverance, which will instantly appeal to all who have gone through the nasty task of handling gravity cells. As shown in the illustrations, a small hole is made through the jar near the top, through which the conductor leading from the copper is carried and given a twist. The ordinary practice is to carry the wire from the copper electrode up through the solution, for the purpose of making connection with the external circuit or with a neighboring cell. This plan has been followed for 50 years, and every time in that whole period when a renewal of solutions or change of connections was necessary, the copper has been shifted and the solutions mixed, resulting in a deposit of *mud* on the zinc. It is strange no one thought of binding the wire so that the copper would be locked in position. The simple way in which this end may be accomplished is shown by the engravings. Another curious feature is that the idea should have occurred to two inventors at the same time. Mr. Varley found that an old telegrapher, Mr. P. B. Delany, had hit upon the same idea, and had filed an application in the United States Patent Office a short time before his application was put on file. The interference was avoided by compromise, the right to manufacture and sell the jars being reserved to Mr. Varley and the patent issuing in Mr. Delany's name. The really difficult stage of the invention materialized when an effort was made to have the jars made. It was discovered that to drill the holes would make the jars so expensive that they would not meet with a liberal commercial reception. Several glass blowing concerns were applied to, but none of them could make the jars with a smooth hole in them without drilling or molding and both processes raised the price of the jars to a prohibitive plane. An idiosyncrasy of all true inventors is perseverance and Mr. Varley was well seasoned with this leavening. It occurred to him that the hole might be *punched* in the glass and when the glass-blower rejected the idea as impracticable, he was treated to an object lesson in his own art. Mr. Varley picked up a pair of shears, lying on the workman's bench, and found he could cut the glass immediately after the workman had given it its final shape as easily as so much dough. A perforating punch acting like shears was procured and found to work admirably, and the operation is one of such simplicity that the jars can be put on the market at the same price as the ordinary gravity jar. Arrangements have been made to furnish them in large quantities. J. Jones & Son, manufacturers and dealers in electrical apparatus, New York, will handle them commercially. The electricians of the Western Union Telegraph Company are much pleased with the jars. They will doubtless soon be in general use. The punched hole has a smooth edge and a filled cell can be lifted by the wire, as shown in the engraving, with entire safety. The idea is as clever as it is simple and deserves the favorable commercial recognition it is sure to receive.

FIG. 1.—SKETCH OF VARLEY'S BATTERY JAR.

REMOVALS.

VARIOUS CHANGES IN LOCATION AMONG THE ELECTRICAL INTERESTS.

In accordance with our annual custom we announce below the names of various companies and others who will make a change of location May 1.

The Thomson Electric Welding Company's New York office will hereafter be at 44 Broad street.

The Detroit Electrical Works' Boston office has been removed to Room 23, Fiske building, 89 State street.

The Excelsior Electric Company will remove from 115 Broadway to the Edison building, 44 Broad street.

The Fort Wayne Electric Company's New York office will remove from 115 Broadway to the Edison building, 44 Broad street.

The "American Machinist" will remove its offices from No. 96 Fulton street to the *Mail and Express* building, 203 Broadway.

George Cutter, of Chicago, finds his present factory too small and has secured a larger one at 315 South Canal street, Chicago.

The Electric Construction and Supply Company's Chicago office has been removed from the Phenix building to the Unity building.

"The Electrical Engineer" will remove from 115 Broadway to the ninth floor of the new *Mail and Express* building, 203 Broadway.

The Thomson-Houston International Electric Company's offices have been removed from 115 Broadway to the Edison building, 44 Broad street.

The International Register Company will remove their office from 435 "The Rookery," to 302 Dearborn street, Chicago, where their factory is located.

The Railway Equipment Company, of which Mr. W. R. Mason, is general manager, will occupy temporary offices at 617 to 619 Pullman building, Chicago.

Kohler Brothers, representing the Eddy Electric Manufacturing Company, will remove from "The Rookery" to Rooms 1417 and 1418, the Monadnock building, Chicago.

The Office of A. G. Day will remove from 12 Dey street to the improved annex of Western Union building, 195 Broadway, or to the *Mail and Express* building, 203 Broadway.

Curtis & Dean, New York agents of the Thomson-Houston Company, will remove from 115 Broadway to the Edison building. They will occupy offices in the New street end of the building on the fifth floor.

FIG. 2.—VARLEY'S BATTERY JAR EQUIPPED.

Siemens & Halske will give up their New York offices, which have been under the able management of Alexander von Babo, and will occupy an office at Room 1219 Monadnock building, Chicago.

The Brush Electric Company will remove its New York office from the Boreel building, 115 Broadway, to the Edison building, 42 and 44 Broad street. The new offices will be on the fifth floor of the Edison building, Rooms 1, 2 and 3.

L. F. Rondinella, M. E., secretary of the Electrical Section of the Franklin Institute, has opened new offices at 705 Chestnut street, Philadelphia, where he will attend to the wants of clients and friends who desire the services of a mechanical, electrical or civil engineer.

The Utilization of Wind Power.

BY W. H. BOOTH.

I have seen to-day a method of utilizing wind power which is to me novel.

Americans who have traveled in Holland well know the form which is taken by the old world style of windmill. The sail is a huge affair of perhaps 60 feet diameter, with usually four ponderous arms, though in England windmills with five and six arms are not infrequent, and sometimes two arms only may be seen.

I believe, too, that the old style of mill is to be seen in Canada, where it takes a look of age quite equal to any Dutch drawing of a mill. Cervantes describes Don Quixote as charging a battery of windmills, and one might almost suspect the picture to be overdrawn. I have, however, seen 15 or more mills standing in a row upon a hill in Portugal, somewhere near Cintra, and in full view from the ocean, whilst near to them was a row of several others.

Until the introduction of the American mill, with its annular sail and numerous laths, the only windmills in England were of the old, or, as I call it, the Dutch type. Now, however, there are a large number of the smaller American mills to be seen.

There is one in London perched high up on a timber tower erected on the top of a building on the City Road, not far outside the old "City" boundary. It has a sail of 30 feet diameter and is quite a big affair when one climbs to the top of the tower. But what I specially wanted to note was the fact that this windmill is lighting the premises over which it stands.

Its upright shaft, which comes down from the mill, drives a horizontal shaft which carries a large belt pulley, and by this large pulley is driven a small dynamo. The dynamo generates current which charges a battery of accumulator cells, and these in turn "drive" the lamps. At times, of course, when the wind is low, the speed falls below what is proper for the charging of the secondary battery. To prevent this being charged at such low speeds there is a cut-out held in by a magnet and kept out by a coiled spring.

When the magnet is weak the current is cut off from the accumulators, but when the dynamo is running at a fair speed the magnet is strong, and pulls the switch into contact and the charging proceeds. The mill will run and charge all night and all day, and is acting very satisfactorily. Of course, in quiet weather it runs much of its time slowly and, therefore, uselessly, but it also runs the night through and I suppose would, on an average, do eight hours' work in 24, which is used by some as nature's argument in favor of an eight hours day. The man who owns the mill has got his name very prominently upon the director fan of the mill or wind vane, and an attempt has been made to bring it in under the sky sign regulations; but it has been held that a windmill is not a sky sign, but a useful institution, which the common or garden variety of sky sign certainly is not, and so the miller has got his sky sign after all.

Makers of American windmills ought to take note of this fact, and turn their attention to the manufacture of a windmill which, while serving a useful purpose as a generator of electric light, will wave its owner's name and his particular productions before the eyes of a city. There are those unkind enough to suggest that the dynamo and accumulators are only so much blind to cover the sky sign, but I don't believe this, for the whole installation is too neat and complete, and for the purposes of a blind the owner would scarcely go to the expense of a really good dynamo and a lot of cells, when he might have arranged something at a less cost, as, for example, a timber nutmeg lathe which would have better met the eternal fitness of things.

Anyhow, this electric installation is a matter of interest and well worth a visit. This is the first example which has come under my notice of electric light production by wind power, the uncertainty of which is usually held to debar it from so many useful avenues of work.—*American Machinist.*

A New Edison Search-Light Projector.

The Edison General Electric Company has recently designed the type of search-light projector illustrated herewith. One illustration shows the side and front view and the other the lamp mechanism, which will give a good idea of the general style of this projector.

The lamp is designed to run on an incandescent circuit with a potential of 50 to 55 volts, at which it requires about 15 amperes of current and gives a light of 3,000 candle-power. A suitable resistance is placed in series with the lamp to permit its adjustment to the potential of different circuits upon which it may be used. The lamp is both self-regulating and self-focusing. The lower carbon is pressed upwards against fixed stops by a spiral spring, thus maintaining the arc in the focus of the reflector. A hand adjustment is provided for raising and lowering these stops, by which the vertical position of the arc can be altered. The upper carbon falls by gravity, its descent being perfectly regulated by the lamp mechanism, so that great steadiness of light is obtained. The negative carbon being placed a little back of the line of the positive carbon, a crater is thus formed on the side of the latter and nearly all the light is thrown toward the reflector. A ventilating hood on the top of the drum provides an escape for the heat.

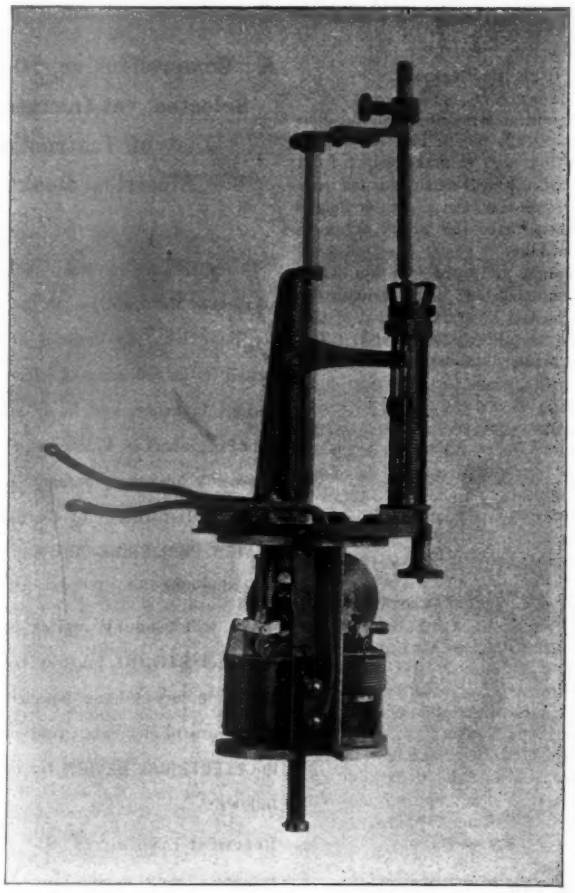


FIG. 1.—INTERIOR MECHANISM OF EDISON SEARCH-LIGHT PROJECTOR.

The drum is of iron and 18 inches in diameter. A highly polished silver plated parabolic reflector, 17 inches in diameter, with five inch focus, is mounted at one end of the drum on a finely threaded screw piece, by which it can be moved to or from the arc. By this means the light can be concentrated in a narrow beam or be widely diverged. The usual focus in projectors of this class is from two inches to three inches, and considerable advantage is derived by the increase in focus obtained in this projector. A fine hole is drilled through the screw piece on which the reflector is mounted, through which the exact position of the arc is shown on a small piece of ground glass.

The drum is provided with vertical and horizontal adjustments. The vertical adjustment is effected by means of a band wheel operating a double threaded screw. It has a vertical movement of 30 degrees, 15 degrees above and 15 degrees below the horizontal line, which is sufficient for ordinary purposes.

The horizontal adjustment permits a complete revolution of the drum upon its base, so that the light can be readily thrown toward any point of the compass. By means of a clamp screw the drum can be quickly fastened in any position.

Provision is made for a card attachment in order that the projector may be operated from a distance if preferred, as, for instance, from the pilot house, when the projector is set at the bow or any other part of a vessel.

The connecting terminals for the lamp are placed on opposite sides of the drum; the conductors can, therefore, be brought up in the form of spirals without risk of their "crossing."

The height of the projector is 48⅛ inches and the center of the reflector is 36 inches above the bottom of the base. The floor space required for the base is 22 inches in diameter.

This projector is simple, strong and substantial, and all the parts have been arranged with a view to secure efficient and easy operation. It is estimated that in clear weather the beam of light will have an effective range of 2,000 yards. The compactness of the entire apparatus renders it especially advantageous for use on vessels, wharves, etc.

Blaine and the French Cable Company.

The joint resolution granting to the French Cable Telegraph Company, of Paris and New York, the right to land a cable on the shores of Virginia and South Carolina, thence to go from Cuba to San Domingo, was the subject of a hearing on April 28 before the Senate Committee on Commerce, at which Secretary Blaine, members of the French Legation in Washington and attorneys for the company were heard.

Secretary Blaine made a vigorous protest against favorable action, or any action at all, on the resolution, urging that it should be killed in the committee. He said he did not believe in giving a hearing in any form. The United States wanted to secure direct cable communication with Brazil, and there were reputable men ready to build such a line. If the Senate gave the French company the right to land in Virginia or South Carolina this could not be done. The Brazilian government had given the French company the exclusive right to land for 35 years, and if the right to land in the United States were given by Congress a monopoly would be given the company, and the United States would be prevented from having cable entry into Brazil during the period of exclusiveness. The sending of all messages by way of London and Paris would place the United States merchants under great disadvantage and at great expense, and the construction of the line would prevent the establishment of an American line. Such a line he believed would be under way in a year if Congress did not give to the French company the right asked. All cable lines, he said, sought to preserve a monopoly, and where there was a monopoly the service was usually bad. When the United States had a line in competition with the French and English lines, then this country would get cheaper rates.

Mr. Blaine said the French company had been represented by counsel for two years before the State Department, and had used every means to secure permission to land the cable. It had buttonholed Congressmen and used other means to get the resolution passed. In conclusion, Secretary Blaine said he would deeply regret favorable action on the resolution by Congress.

The Hon. Jeff Chandler and Gen. Eppa Hunton, counsel for the company, made brief arguments in support of the resolution. They contended that Congress had no right to interfere in the right granted to the company to land by the legislatures of Virginia and South Carolina.

ELECTRIC LIGHT NEWS

—— Another electric light plant will be established at Cumberland, Md.

—— Edgewater, N. Y., has advertised for bids for lighting the streets by electricity.

—— The Detroit Electric Arc Light Company has sold its plant at Pontiac, Mich., to a stock company for $40,000.

—— The Roaring Fork, Colo., Electric Light and Power Company has increased its capital stock from $200,000 to $400,000.

—— The Malden, Mass., Electric Company are to build a new $50,000 plant adjoining their present establishment on Center street, Malden, Mass. When completed, the company will furnish day power and lighting service.

—— The Nemasket Yarn Mill, at East Taunton, Mass., will be lighted by 350 incandescent lamps and 54 Ward arc lamps. When possible, the mill will be run by water power, the Stilwell & Bierce Manufacturing Company, of Dayton, O., having installed six water wheels.

—— The Minneapolis council committee on gas has decided to advertise for bids for lighting the streets of the city for five years, after the expiration of the present contracts (August 26 and September 1), on the moonlight schedule and on the all-night schedule also. Gas and electric bids will be asked for.

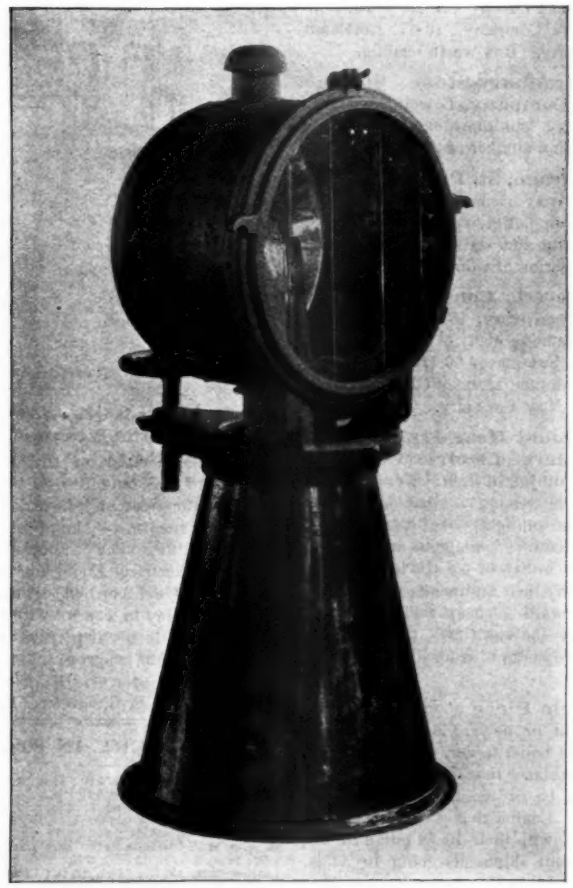


FIG. 2.—GENERAL VIEW OF EDISON SEARCH-LIGHT PROJECTOR.

Oxford, N. Y.—The Oxford Electric Light Company; capital, $10,000. Promoters, Frederick L. Gamage, Charles A. Gillman, James S. Van Wagenen, all of Oxford, N. Y.

Pasco, Wash.—Pasco Union Land Company; capital, $750,000. Promoters, Louis C. Frey, R. Olney, W. P. Gray, all of Pasco, Wash. Incorporation papers sent to R. Olney, Pasco, Wash.

Montgomery, N. Y.—Walden Electric Light and Power Company; capital, $10,000. Promoters, Joseph Broadhead, West Cornwall, N. Y.; Nicholas J. Fowler, Irving H. Loughran, Walden, N. Y.

—— The Thomson-Houston Electric Company has just contracted to place a $150,000 electrical plant at the eastern opening of the Atlantic-Pacific Railway Tunnel Company's tunnel. This tunnel, when completed, will reduce the distance to Denver by almost 300 miles. The electric power from the plant will be used in drilling and lighting, as well as for motive power in propelling the cars which carry the ore and rock from the tunnel.

KINDRED INTERESTS

The List of Electrical Patents issued during the past week will be found on page xii of this issue. Our list of patents, which is considered to be of great importance by our readers, has been crowded out at times. We have now placed it in a location where it can have sufficient space allotted to it. A list of recently incorporated electrical companies will also be found on page xii.

Waterhouse Brothers, Hartford, Conn., have a reputation for doing first-class experimental and electrical work.

The American Telephone Booth Company, 18 Cortlandt street, New York, has issued an interesting catalogue of their folding telephone booths.

The Electric Engineering & Supply Company, of Syracuse, N. Y., has issued a very handsome and tastefully printed catalogue of its goods.

The New England Conservatory of Music, Boston, Mass., is installing a 35 horse-power Ball engine, furnished by the Ball Engine Company, Erie, Pa.

The Interior Conduit and Insulation Company's catalogue No. 7, issued April 1, should be in the hands of every one interested in safe wiring.

Vulca Duct is the subject of a neat pamphlet sent out by the New York Insulated Wire Company, 13-17 Cortlandt street, this city. It is worth reading.

The Bradbury-Stone Storage Battery Company, Lowell, Mass., has issued a very handsome catalogue of its batteries with a number of testimonials.

The Chicago, St. Paul & Kansas City Railway has issued a very neat and complete pamphlet giving an official list of officers, agents and stations, together with other information of value to the traveler.

The Electric Construction and Supply Company, 18 Cortlandt street, New York, among many other recent installations, has just placed 70 Ward arc lamps in the large double store of Charles Broadway Rouss, New York city.

You Should Hear Mr. Seymour of the Clark Electric Company talk on the subject of light. He has some exceedingly interesting comparisons relative to the cost of sunlight *versus* electric light. His enthusiasm is contagious and any one doubting the utility of electric lighting will have to fortify their arguments against it by bringing forward a cheaper light than that furnished by the sun's rays to in any way lessen Mr. Seymour's ardor or prove their case.

No Single Piece of machinery in an electric light or power plant is more sensitive than the boiler feeder. It is, therefore, of high importance that the pumps used for this purpose be of the highest excellence. The Pond Engineering Company report great success with their Blake pump for this service, recent shipments going to Albia, Ia., Electric Light Company; Holden, Mo., Electric Light Company; Warrenton, Mo., Electric Light Company; Janesville, Wis., Electric Street Railway Company; Camden, Ark., Electric Light and Power Company, 2; Cicero and Proviso Street Railway, Chicago, and Vincennes, Ind., Electric Light and Power Company, 2.

We extract the following notice from the *Baltimore American* of April 22, regarding the conduit system of the Interior Conduit & Insulation Company, of New York: "The contract for the electric equipment and interior wiring of the new City Hall at Richmond, Va., was awarded yesterday to the Southern Electric Company, of this city. This is one of the largest contracts of the kind ever made. The company will use the Interior Conduit Company's system throughout, which comprises a method of insulating tubing, together with all the modern appliances for safety and convenience, giving full control of the electric plant at one central point in the building. The contract was awarded to the Baltimore house owing to the superiority of their work, although they were not the lowest bidders."

"Every Day from May to May." —This is the title of a neatly bound small book, covered in white and carrying in colors the imprint of the long distance telephone. On opening the covers a diary is found. The book is sent with the compliments of the American Telephone and Telegraph Company, 18 Cortlandt street, New York. On the title page is this information: About 1,000 cities and towns, containing 80,000 telephone subscribers are now connected by over 100,000 miles of telephone line, affording the means of personal intercommunication to 30,000,000 people. In New York city 8,000 subscribers through eight exchanges are connected by 20,000 miles of wire and use the telephone more than 100,000 times per day. In 1891 more than 400,000,000 conversations were carried on by telephone in the United States.

THE POET SHOCKER.

POET.—I have written some triolets which I should like to have published in your valuable paper.
EDITOR.—Take a seat, please.—*Puck.*

The Advisory Council of the World's Electrical Congress.

Upon the invitation of Dr. Elisha Gray, chairman of the Committee on the World's Electrical Congress, an informal meeting of the eastern members of the advisory council was held at the rooms of the American Institute of Electrical Engineers, New York city, on Tuesday, April 26. It was the object of Dr. Gray to consult with the members previous to his departure for Europe on business of the congress. The following members were present: Dr. Elisha Gray, chairman, Prof. F. B. Crocker, Prof. A. E. Dolbear, Dr. William E. Geyer, Mr. G. A. Hamilton, Mr. A. E. Kennelly, Mr. Thos. D. Lockwood, Mr. T. C. Martin, Mr. Geo. M. Phelps, Mr. Franklin L. Pope, Dr. M. I. Pupin, Mr. R. W. Pope. Letters of regret were read from Professors Alexander Graham Bell, Geo. F. Baker and John Trowbridge. It being simply a gathering of a portion of the council, no formal action could be taken, but it was unanimously agreed that the last week in August, 1893, would be the most suitable time for the meeting of the congress, and this date will doubtless be recommended. Dr. Gray sailed for Europe on the "Majestic" April 27. He is accompanied by Prof. H. S. Carhart, secretary of the committee.

High Smokestacks.

TO THE EDITOR OF ELECTRICAL REVIEW:

Mr. Indermill, in a recent communication to your paper, calls me to task for a statement regarding high chimneys which I did not make. If the gentleman had read my article over with care and a greater degree of comprehensiveness he would not have made the mistake.

In the course of my description of the contemplated extensions to be made by the Edison Light and Power Company, of this city, I made the following statement: "The Jesse street plant, which is to have a chimney 128 feet high and 28 feet square at the ground, will be *one* of the largest in the world." It is obvious, therefore, that I had reference to the Jesse street plant, and not to the chimney. We are surprised to learn that Michigan cannot show up anything larger than a 252 foot smokestack. We have such a quantity of big things in California that a thing of this kind seems insignificant. Respectfully,

J. R. KNOWLAND.

San Francisco, Cal., April 21, 1892.

Plans are being prepared for a new electric power house for the Denver Tramway Company.

MACHINERY IN STOCK.

Engine Lathes, 10 in. x 4 ft.; 11 in. x 5 ft.; 12 in. x 6 ft.; 14 in. x 6 ft.; 16 in. x 6 ft.; 18 in. x 8 ft.; 20 in. x 8 ft., with tapes attachment; 22 in. x 12 ft. and 14 ft.; 24 in. and 26 in. x 16 ft.; 30 in. x 10 ft. and 18 ft.; 36 in. and 38 in. x 20 ft.; 42 in. x 12 ft.; 27 in. x 32 ft.; 88 in. x 31 ft.; 96 in. x 30 ft. Fox Lathes, 13 in. x 5 ft.; 14 in. x 5 ft.; 15 in. x 6 ft.; 18 in. x 6 ft. Turret Lathes, 12 in. x 5 ft.; 14 in. x 5 ft.; 15 in. and 16 in. x 6 ft.; 18 in. x 6 ft.; 36 in. x 8 ft.

Planers, 16 in. x 16 in. x 3 ft.; 20 in. x 20 in. x 4 ft.; 24 in. x 24 in. x 6 ft.; 30 in. x 30 in. x 6 ft.; 36 in. x 36 in. x 10 ft.; 42 in. x 42 in. x 12 ft.; 44 in. x 48 in. x 22 ft.; 60 in. x 49 in. x 24 ft.

Friction Shapers, 15 in., 16 in., 20 in., 22 in., 32 in.

Crank Shapers, 6 in., 8 in., 10 in., 12 in., 13 in., 16 n., 17 in., 20 in., 24 in., 28 in.

Screw Machines, Nos. 1, 2, 3, 4, with or without Wire Feed.

Screw Machines, Nos. 5, 6, 7, 8, Power Feed.

Presses, Nos. 51, 52, 53, Ferracute; Nos. 1, 2, 3, Stiles & Parker.

5 Lincoln Pattern Millers, No. 2.

Hand Millers, Nos. 1 and 2. 3 Cam Cutters.

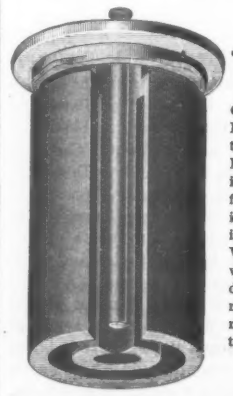
Bolt Cutters, ¼ in. to 1 in., ½ in to 2 in.

2 Profiling Machines. 1 36 in. and 48 in. Gear Cutter.

C. D. and E. Horizontal Boring Machine. Newark Machine Tool Co.

Send for List of New and Second-Hand Machinery in Stock.

PRENTISS TOOL & SUPPLY CO., P. O. Box 3362, 115 Liberty Street, New York. 59 South Canal St., Chicago, Ill.



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